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## Attitude in Relation to Learning

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CONTENTS

THE PSYCHOLOGY OF THE SENSES

THE PSYCHOLOGY OF THE EMOTIONS

THE PSYCHOLOGY OF THE INTELLIGENCE

THE PSYCHOLOGY OF THE PERSONALITY

THE PSYCHOLOGY OF THE ABNORMAL

THE PSYCHOLOGY OF THE EDUCATION

THE PSYCHOLOGY OF THE SOCIAL

THE PSYCHOLOGY OF THE HISTORY

THE PSYCHOLOGY OF THE LITERATURE

THE PSYCHOLOGY OF THE ARTS

THE PSYCHOLOGY OF THE SCIENCE

THE PSYCHOLOGY OF THE PHILOSOPHY

THE PSYCHOLOGY OF THE RELIGION

THE PSYCHOLOGY OF THE POLITICS

THE PSYCHOLOGY OF THE ECONOMICS

THE PSYCHOLOGY OF THE LAW



## TABLE OF CONTENTS

|   | PAGE |
|---|------|
| Introduction .....                          | 1    |
| History of the problem.....                 | 1    |
| Description of experiments.....             | 17   |
| Introduction to experiments I, II, III..... | 17   |
| Experiment I, with children.....            | 44   |
| Experiment II, with adolescents.....        | 82   |
| Experiments III, with adults.....           | 102  |
| Introduction to experiments IV, V. VI.....  | 111  |
| Experiment IV, with adults.....             | 111  |
| Experiment V. with adolescents.....         | 118  |
| Experiments VI, with children.....          | 127  |
| Conclusions and interpretations.....        | 130  |
| Bibliography .....                          | 142  |



## I. INTRODUCTION

The investigation reported attempts to discover changes of an objective sort present in the process of learning, which changes accompany differences of attitude on the part of the learner. In arranging the experiments, the writer wished to insure the presence of a learning process and to arrange some accompanying control of attitude, the effect of which could be observed. The endeavor was to throw light on the following questions: What changes take place in the process of learning by the individual because of the presence of a given attitude with the learning response? Can some method be discovered for recording objectively such changes in the process of learning? Are different attitudes equally effective in varying the learning response? What differences, if any, are there in the effect of the attitude with varying degrees of intelligence and with change of chronological age? Can qualitative as well as quantitative differences be observed in the process?

The experimental work was conducted in the psychological laboratory at Stanford University during the years 1922 and 1923. The work with the children and with the low mentality groups was carried on during the same time in the Palo Alto Schools, the Palo Alto Military, and the Whittier State School.

## II. HISTORY OF THE PROBLEM

### 1. Attitudes in relation to other psychological topics.

Until very recent times little attention has been given to the study of variations in response due to differences of attitude of the subjects responding. Even recently such notice has been largely incidental in solving other problems of behavior. The history of the treatment of attitudes is embodied in the literature on meaning (1), generalization (43), attention (115), memory (22, 31, 38, etc.), imagery and imageless thought (1, 7, 83, 86, 88, 103, 164, etc.), feelings (107, 165), association (28, 31, 34), sug-



gestion (131), judgment (81), volition (1), learning (6, 17, etc.), and other treatments of a psychological nature having a reference to the thought process and its accompanying behavior. In addition the literature on animal behavior (144, 145, 153, etc.) has presented a great variety of facts related either directly or indirectly to this problem. The recent dynamic trend in the interest and point of view of a number of students of behavior (34, 163) has grown out of the discovery of numerous facts bringing to notice the functioning, as determiners of behavior, of previously unnoted and oftentimes consciously vague or unconscious experiences.<sup>1</sup>

A complete summary of the problem of attitude and its treatment up to 1908, including a review of the experimental work related to the problem, is given by Titchener in his *Lectures on the Experimental Psychology of the Thought Process* (149). A summary of the literature having a reference to generalization and the general concept, up to 1916, is given by Fisher (43). This latter summary reports, along with the literature on her own problem, the theories and experimental facts with reference to the problem of attitude. Book, in 1910, gave a summary of the treatment of attitude up to that date (17a). Book's summary deals directly with attitudes. Clark, in 1911, discussed conscious attitudes, including in this treatment a summary of the experimental literature (24). Because of the above mentioned studies, and several others indirectly related to the subject, the writer will, therefore, give here only such treatment as seems desirable to orient the reader in this field and to introduce the present series of experiments.

## 2. Terms used to designate attitudes.

Various terms have been used to call attention to the functioning of attitudes in the conscious process. "Hobbes in *Leviathan* distinguishes between mental discourse which is *unguided*, without *design* or *purpose*, and mental discourse regulated by some *desire* or *purpose*" (149). Müller and Schumann, in 1889, men-

<sup>1</sup> References reported are illustrative and not exhaustive of types of treatment mentioned.

tioned *Einstellung*, motor *predispositions* (149). Külpe, in 1893, called attention to the fact that "the *preceding state of consciousness* is of first importance in all reaction time experiments" (149). Stout in his *Analytic Psychology*, 1896, maintained the occurrence of *imageless thoughts*, "a mode of presentational consciousness not composed of visual, auditory, tactual, and other experiences derived from and in some degree resembling in quality the sensations of the special senses." He said also, "There is no absurdity in supposing such modes of consciousness to possess a representative value or significance for thought" (136, 149). J. R. Angell, 1897, in answer to Stout's statement, recognized these phenomena which Stout mentioned, but said that he found such imagery describable as a "matrix of vague, shifting, auditory word images, in which the significant word is likely to be most prominent, and which is accompanied by a *tingling sense of irradiating meaning*." This last, Angell said, is likely to be translated into associated images of a definite sort. Angell spoke also of a *quasi affective attitude of familiarity* and a *feeling of placid conviction* that the explicit associations could be summoned if desired (7, 149).

Mayer and Orth first used the term *Bewusstseinslage* in 1901 at the suggestion of Marbe. Mayer and Orth found that words were sometimes recalled by means of interpolated processes which might take the form of volitions, words, or of a "peculiar conscious process not characterized by detail." These last were called *Bewusstseinslagen*. These processes refused description in detail and were hard to characterize. They were sometimes affectively toned and sometimes indifferent (83, 86, 149). Orth, in 1903, using the term *Bewusstseinslage*, with its outlined meaning, attempted to identify or relate the conscious attitudes (*Bewusstseinslagen*) with the *fringe of consciousness* of James, with the *quality of familiarity* of Höffding, and with some of Wundt's *feelings*. Using doubt as an illustration, Orth says "doubt is not a feeling, but a complex conscious state, whose constituent element is the *Bewusstseinslage* peculiar to it" (107, 149).

Ach, in 1905, introduced the term *Bewusstheit* to cover the



fact that he described as the "imageless presentation of a total knowledge content." This referred to the beginning of the after period in his experiments when his observers reported frequently a peculiar consciousness of what they had just before experienced. "It is as if," they said, "the whole experience were given at once, but without specific differentiation of contents." This knowledge, or *Wissen*, is Ach's *Bewusstheit*. Ach distinguished two kinds of awareness, awareness of meaning and awareness of relation. The awareness of relation of Ach is the *Bewusstseinslage* of Marbe. In such cases of attitudes we are *eingestellt*, *predisposed*, or *adjusted* to receive a certain impression. Ach is in agreement with Watt in calling attention to the determination played in directing consciousness by a *purpose*. This purpose or *Absicht* is analyzable, according to Ach, into idea of end, *Zielvorstellung*, and idea of object, *Rezugvorstellung*. This *Zielvorstellung* is the same as Watt's *Aufgabe*. Also from *Zielvorstellung* Ach develops his *determining tendencies*. "Although it seldom appears in consciousness, when the object is perceived, the stimulus presented, it nevertheless determines our reaction on the object. . . . The *Aufgabe*, the *Zielvorstellung*, itself unrepresented in consciousness, has raised to supraliminal intensity the single reproductive tendency that accords with the purpose of the observer. These *dispositions*, unconscious in their operation, which take their origin from the meaning of the idea and look toward the coming perception of the object, 'these *dispositions*,' says Ach, 'that bring in the brain a spontaneous appearance of the determined idea, we call the *determining tendencies*' " (1, 149).

Watt, also in 1905, emphasized the importance of the *Aufgabe*. He says that the problem must have been conscious as a specific problem, at some time in the past, if the present experience of the observer is to be a judgment; but it may with repetition tend more and more to disappear; so that finally nothing is left but its *specific determination* and judgment is touched off mechanically, automatically, and so to say reflexly by the experimental surroundings. Watt says that there are three fairly well defined spheres of influence: (1) that of *reproductive tendency*, (2) that



of problem of *Aufgabe*, and (3) that of the *conscious or co-conscious* activity of the problem, on the one hand, and of the contents which may be relatively independent, on the other. Watt's *determinate task* or *Aufgabe* has been continually noted in all later references to the subject (149, 155). Marbe emphasized the same idea, calling attention to it as the *Absichtlichkeit* or *purpose* as a determining factor (83, 84, 149).

Binet, in 1908, reported the fact that his observers found *réflexions*, *idées*, and *pensées* which were imageless and distinguishable from the image content. These observed facts are, according to Titchener, to be regarded as *Bewusstseinslagen* of Marbe (16a, 16b, 85, 149). Woodworth, in 1906, found the *Aufgabe* an important element in explaining conscious functioning. He found that an association may take place in consciousness simply as a result of an *Aufgabe*, or that the transferred relation may have an image as its vehicle; again it may be in consciousness as an "imageless thought" without any vehicle (149, 164).

Bühler, in his introspective reports, 1907, found conscious ideas, feelings, attitudes, and in addition a thought element. The attitude, *Bewusstseinslage*, is, according to Bühler, "a consciousness of the process of thought, and more especially of the turning points of this process in experiencing itself." Knowledge, *Wissen*, "is a new manifold of modifications of our consciousness, covering the variety of thoughts as the general term sensation covers the variety of sensations." This leads to his definition of the thought element (21, 149).

Müller-Freienfels coined the word *Stellungsnahme* to cover the meaning of the conscious attitude. It refers directly to the *Aufgabe* or the determination of instruction in the development of consciousness (96, 97, 98). Grünbaum, 1908, emphasized the *Einstellungen*, *Aufgaben* of Watt, and used *Zielstrebung* to cover *Means*, which is a limited form of *Einstellung* (49, 50).

Titchener, in 1909, summarized all of the preceding literature, and said that *Aufgaben* are for him accepted facts of psychology. "These *Aufgaben*," according to Titchener, "come to consciousness, in part, as different feels of the whole body; I am somehow

a different organism, and a consciously different organism. . . . These *attitudinal feels* are touched off in all sorts of ways: by an author's choice and arrangement of words, by the intonation of a speaking voice, by the nature of my physical and social environment at large" (149).

Pillsbury, in a more recent discussion, related attitude to *attention*. He mentions the effect of the *Aufgabe*. He says: "The action corresponds directly to the directions given or to the *attitude* of the subject as the result of some antecedent experience. . . . On the basis of general observation one may add more and more remote experiences to the group of events that aid in selecting one from the many stimuli to control the act, or that control the course of thought in which the particular memory that initiates the act constitutes the link. . . . From stimulus we must go back to *attention*, but attention proves to be a name for *purpose* or *attitude* and *earlier experience*" (115).

The above variety of terms is used to indicate facts that have a resemblance in a great variety of response situations, and their use suggests that some such term as attitude is useful in pointing out this group of facts. A recent report from the Committee of the American Psychological Association on "Definition and Limitation of Psychological Terms," gives *Mental Attitude*:

(a) A stabilized set or disposition.

(b) (*Bewusstseinslage*) An abbreviated but comprehensive experience, occurring principally in connection with affective, cognitive, and conative processes, and at present incompletely analyzed.

(c) (*Einstellung*) A specific mental disposition toward incoming experience whereby that experience is modified.

(d) Any mode of consciousness in which a self relates itself to its environment (119).

### 3. Elaboration and classification of Attitudes.

In addition to noting facts of attitude and to coining some term to mark out this group of facts, in almost every treatment some elaboration and classification of the attitudes has been attempted. A number of classifications are purely logical, and the elaboration



consists in pointing out and naming without any attempt to analyze, describe, or interpret the phenomena named or to bring them into relation with other conscious facts; nevertheless such elaboration and attempts at classification help to clarify ideas with reference to the problem. Only a few such elaborations and classifications will be reported to illustrate this development.

Marbe's observers, although unable to describe their attitudes because of their indefiniteness, did nevertheless give some characterization in terms of the names used to call attention to the group of facts under observation. Although they classed as emotion, curiosity, expectation, and wonder, they classed as attitudes the somewhat related experiences of doubt, uncertainty, difficulty, hesitation, ignorance, assent, etc. In addition they called attention to such facts as remembrance of instructions, recollection of the past conversation, realization that sense or nonsense is coming, recollection that one is to answer in sentences, etc. (83, 149).

Ach's *Bewusstheiten*, as we said before, were of two kinds, awareness of meaning and awareness of relation. In addition, there were to be found transitional forms. Of these transitional forms are mentioned, (1) determination that the present flow of mental processes is or is not directed by some preconceived purpose or some foregone suggestion; (2) the special case of the determinate awareness of tendency, a general knowledge that the course of consciousness is determined without specific representation of its direction or goal. Ach gives, as special illustrations of the awareness of relation, surprise, perplexity, doubt, satisfaction, certainty (1, 149).

Messer classifies the attitudes as *emotional attitudes* and *intellectual attitudes* and gives a logical definition of the two groups. He says that, "anything and everything can be made the topic of thought and appear in the form of a conscious attitude. . . . The intellectual attitudes are matters of the understanding, as of reality, spatial and temporal properties and relations, of casual connection, teleological connection, and logical relation. The emotional attitudes are those in which a feeling of pleasantness or unpleasantness is usually reported by the observer



† or in which we may trace the influence of will." The emotional attitudes are therefore complicated by affective and volitional elements although these are not the attitudes but the concomitants of the attitudes. These emotional attitudes are defined as those having as content the relation between the subject and the object of thought, etc. Illustrations of this group of attitudes are familiarity, appropriateness, relevancy, question, reflection, doubt, assurance, ease, perplexity, etc. (88, 149).

Watt calls attention to the way in which the conscious attitudes develop. He says: "A preparation that is common to all problems alike consists in a certain adjustment of the body. The observer directs his gaze, more or less attentively, and in a state of expectancy that is accompanied by strain sensations of more or less vivacity, upon the screen that conceals the stimulus word, etc. . . . Now he will say the name of the problem two or three times over to himself. . . . This process is fairly clear in consciousness at the beginning of a series, and especially at the change to a new problem; but it weakens with time, so that in the second or third experiment the name of the problem is said only once, and finally internal speech lapses altogether and the conscious tension almost wholly disappears. All that remains, therefore, is the adjustment of the body, fixation of the screen, and the approach of the lips to the voice key . . . and a state of faint expectancy" (149, 155).

Titchener says: "The notion of an external and precedent determination of consciousness is, of course, familiar enough." He includes under the facts recognized as determiners: command, suggestion, instruction, influence of surroundings, class room atmosphere, laboratory atmosphere, professional attitude, class bias, habit and disposition, temperamental interests and predilections, inherited ability and inherited weakness; all of these terms implying, as Titchener says, "that the trend of the present consciousness, the direction it takes, is determined beforehand and from without, whether in physiological or in purely psychological terms" (149).

Clark says, in connection with her attempt introspectively to

analyze attitudes: "Whatever the outcome of the discussion of imageless thought, it is probable that the name conscious attitude will be retained as a descriptive term." A long list of attitudes whose analysis was attempted with more or less success includes: approval, awfulness, baffled expectation, caution, comfort, comparison, confidence, confusion, consciousness of fitness, consciousness that the letter was too small, decision, decision to disregard the lever, determination, difficulty, disappointment, disgust, dissatisfaction, distance and direction, ease of recognition, easiness, expectation, fear that I had reached too quickly, fright, co-consciousness (setting the tongue), I ought to know that, I have finished my work, the 'I consciousness' (kin. sensation at back of tongue), impatience, injustice, irritation, it must be C, meaning the meaning C, newness, nonrecognition, the passage of time, pastness, powerlessness, pride, readiness, reasoning, reflection, relief, satisfaction, security, strangeness, tendency to stay, conviction that I was right, attitude that I should have pressed sooner, that it is probably not C, thinking over, uneasiness, unfamiliarity, waiting and wondering. A second list of attitudes named but not analyzed included: curiosity, indecision, unknownness, contrast, sense of past time, wondering, ownership. Here, as in other lists, it is noteworthy that the attitude most frequently reported is "doubt." Clark says: "The general conclusion to be drawn from the sum of our results is that conscious attitudes can be analyzed into sensations and images and feelings, or traced genetically to such analyzable complexes, and therefore do not warrant the proposal of an additional conscious element" (24).

Crossland, in his *Analysis of Forgetting*, gives a descriptive analysis of a number of conscious attitudes. The attitudes so analyzed are surprise, disappointment, amusement, excitement, delight, disgust, awe, dismay, wondering, confusion, and doubt. Crossland concludes: "The foregoing introspections show that there were certain characteristic conscious experiences which manifested a composite or complex nature. The complex was not a mere juxtaposing of separate conscious contents and conscious events. All of the parts were fused and unified in one



unitary reaction of consciousness to the situation in hand." "One was able to analyze out some of the constituent elements, but to find the unifying factor or unifying principle, if there was one, that principle which bound these separate processes into one active dynamic reaction of consciousness, was near an impossible task" (32).

One could continue almost indefinitely with the list of special names of conscious states or behavior tendencies mentioned throughout the literature as attitudinal in nature and of importance in understanding response; but the above is sufficient to call attention to the facts under consideration. The nature of the classification has seemingly depended on the purpose and point of view of the classifier. The elaborations have included an unlimited variety of experiences whose characterization, in most cases, has been limited to giving a name to the experience. Nevertheless, there has been enough likeness of facts to give some idea of the definition given to attitude.

#### 4. Results of the study of attitudes.

The results of the study of attitudes have been of two kinds: First, the discovery of the effect of attitude on response has led to a more careful control of the total situation calling forth the particular response being studied. Equivocal results have been found to be the result of lack of control of the attitudinal situation. Secondly, the discovery of the presence of attitudes has stimulated direct experimental work with attitudes. The work along this line has included attempts to characterize, analyze, and describe such conscious states; some attempts have been made to show the effects of particular attitudes in modifying the behavior of the individual or animal in question; further attempts have been made to evolve an experimental technique to bring the attitudes under observation.

#### 5. The behavior of the attitudes in consciousness.

Direct attempts to discover in just what manner the attitudes, when present, tend to modify the process or response have been



few. Nevertheless, there has resulted, incidentally again, an accumulation of facts of some value along this line.

In Külpe's experiments, the outstanding result is the insistence of the importance of the task assigned both for the nature of the elements reproduced and for the actual contents of the observers' consciousness during the observation of the stimuli. Conditions which Külpe found favorable to abstraction were: (1) when it follows after definite predisposition for the part of the contents from which it is to be abstracted; (2) forgetting of what is not accentuated is more complete the more definite and difficult the task; nonaccentuated elements were rapidly forgotten, also actually not present in the observers' consciousness during the noting of the stimulus. Külpe refers these differences to variations in the mode of apprehending rather than to differences in sensational content (43, 76).

Mittenzwei found the limina smaller when procedure with knowledge was employed. The degree of this lowering varied with the factor being changed. Limina for increase and decrease in size varied, as did those for vertical and horizontal displacement. In general, the limina were smaller if the subject knew what factor would vary, still smaller if he knew the position of the change, smallest if he knew the nature of the change (42, 92).

Grünbaum stresses the influence of the experimental task in modifying (1) the nature of the content of the observers' consciousness; (2) their mode of procedure; (3) the nature and number of figures drawn and recognized. He recognizes four kinds of *Einstellungen*: (1) attention to the means of solving the problem, effort to image the coming situation; (2) quiet waiting with the thought, "How can I do it?", kinesthetic rhythm, the number of strokes agreeing with the number of expected figures, accentuation of the strokes where the common figure was expected; (3) no awareness of means nor *Zielstrebung*, the observer being unable to describe how the *Aufgabe* was present (42, 49).

Angell finds in his reaction time experiments that the reaction curve is better as an index of the subject's attitude than the reac-

tion time. He says: "Each single reaction curve is a legible index of the attitude which determines it" (6).

The results of the experimental work, contributed incidentally, with reference to the exact behavior of the attitudes in consciousness, have been of the types illustrated above. The reports are rich with suggested experiments. The problem is left open for a great variety of experimental investigations dealing directly with the study of the manner in which carefully defined attitudes behave in consciousness in the direction of favoring, interfering with, or modifying the nature of a total simple or complex response.

6. Treatment of attitudes under other headings, including the behavioristic treatment.

Most of the treatments outlined above have been stimulated by the attempts at an introspective analysis of the conscious process. As can be readily seen, these treatments either suggested or were definitely related by their authors to treatments of a physiological and of a dynamic nature, being thus connected directly with the problems of modification of responses of the organism. It might be well to include here some definitions and references approaching attitude directly from the behavioristic and functional point of view.

Thorndike states that a mental function may consist primarily in an attitude or primarily in an ability. "Some mental functions such as enjoyment of good reading, desire for approval or misery at being scorned, refer primarily to the satisfyingness or annoyingness of certain states of affairs. Others; such as speed of tapping or ability to give the opposite of certain words, or a knowledge of Russian, refer primarily or even exclusively to the mere act or idea excited by certain situations. Others, such as interest in mathematics, appreciation of music, talent in household decoration, refer obviously to a compound of tendencies to do this or that, think this or that, and also to welcome, cherish, or be satisfied by this, or to reject, avoid, or be annoyed by that. . . . The above stand for certain bonds and readinesses in the neurones, or certain probabilities of the appearance under given conditions



of certain bonds of readiness." This gives a characterization as well as some elaboration of particular attitudes (144).

Watson, in treating the subject of learning, holds that learning is affected by frequency and recency, but is also supplemented by: (1) the general setting of the situation, (2) the situations which have just preceded, (3) the intraorganic factors (toothache, headache, etc.), (4) attitudes developed in the individual by his history and past experiences. All four groups of facts might in other treatments be included under attitude. Watson later introduces the "emotional attitudes." He says: "Combinations and integrations occur among emotional, instinctive, and habitual activities. . . . The whole group is integrated, the part reactions work together. . . . The individual becomes a fighting, defending, unitary action mass. If the environmental factors are such that the actual fighting cannot occur, the subject assumes the 'defiant attitude.'" Watson mentions a large number of these emotional attitudes: submissive, inferiority, lovelorn, lovesick, tenderness, shyness, shame, embarrassment, jealousy, envy, hate, pride, suspicion, anguish, anxiety, etc. He tells us that "there are many combinations of emotional habit and instinctive factors in all of these attitudes. They actually function by limiting the range of stimuli to which the person is sensitive. For the individual they are fundamental attributes of character, as much a part of him as are his arms or his legs or his method of attacking a new problem" (154).

Woodworth, in his more recent dynamic treatment, has avoided the term attitude but includes the development of these tendencies within such phrases and statements as the following: "Any mechanism might become a drive, but it is mechanism directed toward consummatory reactions whether of the simpler sort seen in animals or the complex sort exemplified by human desires and motives that are most likely to act as drives." He also says: "Any mechanism may be, under certain circumstances, the source of stimulation that arouses other mechanisms to activity" (163).

Finally, Dewey, in his *Human Nature and Conduct*, gives a definition in dynamic terms of the character and functioning of

the attitudes. In the index of this text he introduces attitude under the topic of habit. Here he characterizes habit before approaching attitude. He states: "But we need a word to express that kind of human activity which is influenced by prior activity and in some sense acquired; which contains within itself a certain ordering and systematization of minor elements of action, which is projective, dynamic in quality, ready for overt manifestation; which is operative in some subdued form even when not obviously dominating activity. . . . Habit even in its ordinary usage comes nearer to denoting these facts than any other word. If the facts are recognized we may also use the word disposition. . . . Habit means special sensitiveness or accessibility to certain classes of stimuli, standing predilections and aversions, rather than bare recurrence of specific acts. . . . Attitude and, as ordinarily used, disposition suggest something latent, potential, something which requires a positive stimulus outside themselves to become active." Therefore Dewey prefers habit as defined and attitude when used to have the meaning of habits outlined above. "An attitude is a special case of pre-disposition, the disposition waiting, as it were, to spring through an open door" (34).

The experimental work on animal behavior seems to the writer to have a genetic relation, as well as to introduce facts directly related, to the problem of attitude in human behavior. Since the total psychophysical mechanism is less complex in animals, the attitudes when they appear will be relatively simpler and less complicated with conscious elements than is the case with humans. There has been no small contribution with reference to the effect of reward and punishment upon the development or inhibition of response tendencies. In these cases the interpretation has been that pleasantness was associated with reward and unpleasantness with punishment; hence there was a different behavior tendency because of the different attitudes brought about by these incentives as stimuli. Watson presents some figures relative to the effect of reward and punishment on animal response. He says with reference to these results that, "It would seem from work on the white rat, when a habit of responding positively to the



brighter of two lights was desired, that punishment for failure and food for right response gives the most advantageous situation for the rise of habit" (153). Numbers of other factors have been studied in the case of animal behavior which factors proved to be effective in modifying the behavior of the animals studied. It seems to the writer that studies of the effects on behavior of physiological changes, toxic conditions, etc., have a direct relation to this problem, for such modifications interpreted in terms of the organism produce a different behavior tendency or attitude on the part of the animal reacting. A complete review of this literature would be out of place and unnecessary here, but the writer wishes it considered in this connection (142, 143, 147, 153, etc.).

7. Point of view and problem of the present investigation.

"The aim of the present investigation is to discover if possible the direction in which a response to a particular situation is varied with certain definite attitudes selected for study. The experimenter is not concerned so much with the nature of the consciousness that makes up the attitude as with the objectively determinable modifications of response brought about by the presence of the particular attitude. Attitude is defined for the purpose of this experiment as an intellectual affair which may or may not be complicated by emotional elements. The nature of the particular localized response to a definite situation is determined by the situation, by the hereditary nature of the mechanism of the organism, and by the modifications of that mechanism due to the life history of the organism. Attitudes are ideas or meanings which have been set off in the organism by external and preceding or accompanying determination. These ideas do not characterize the particular situation, but do characterize the immediate nature of the responding organism. They may, therefore, vary the nature of the response which the situation brings about. These ideas likewise may or may not remain in the consciousness of the individual. If not conscious, the writer would prefer to think of their functioning as purely on the physiological level.

The writer would classify attitudes as *intellectual* and *emotional*. In both cases the attitude is a meaning or idea developing

in the organism from situations in the environment. The intellectual attitude modifies the direction of the response in the direction of the modifying idea. The emotional attitude modifies the response but this modification is due only indirectly to the idea causing the emotion but directly to the emotion.

The present investigation selects one of each of the above types of attitude for study: (1) The "*intellectual*" attitude selected is studied with reference to its effect upon the response that occurs to a situation where reasoning or generalization is possible; (2) the "*emotional*" attitude is studied with reference to its effect upon the response to a situation where memory only is required. (1) The "*intellectual attitude*" is brought about by the *idea in the mind of the subject that a generalization is possible*; (2) the "*emotional attitude*" is brought about by introducing a control of the situation that *leads the subject to believe that he is better or poorer in the performance of some task than other members of his own group*.

7 8. Control of situations bringing about attitudes being studied.

One of the essential conditions in such a study seems to the writer to be that the subjects reacting must have their attention directed to the task that they are to perform rather than to the attitude being studied, otherwise the process becomes artificial and not necessarily characteristic of the normal functioning of the attitude. Previous experimenters have, in some cases, instructed a subject to assume a particular attitude ("friendly," "pugnacious," etc.). The attitudes in these cases were defined only by the verbal term or name of the attitude and did not represent the attitude as the response due to the idea which the subject arrived at in the natural course of his experience and which brought with it the behavior tendency on his part defined as his attitude. Such experiments have been of unquestioned value, but the response being studied does not, in the writer's mind, parallel the response occurring when the subject's attitude develops from the nature of the situation which is under the control of the experimenter, but this control is unanticipated by the subject and therefore not a matter of focal attention (87, 138). Therefore, throughout these



experiments, the subject has been doing some particular task of learning which has been selected for the observation of the effect of the presence of the attitude on the learning of the task. The results are to be considered as tentative rather than conclusive in the several directions of their reference.

### III. DESCRIPTION OF EXPERIMENTS

Our experiments consisted of two separate and distinct series. The first series had to do with the study of a purely intellectual type of attitude, and the second series with the study of an attitude of a type likely to have emotional accompaniments. In both series of experiments the attempt was to afford a satisfactory problem for learning and, by varying the control of the situation bringing about the attitude, to produce results of an objective type that could be compared. Throughout, the attempt was to get a naïve response from the subject. In every case the subject was led to believe that the problem of learning was the problem being investigated, and not to suspect that the attitudes were under observation.

The two ideas selected for investigation were: (1) the idea that a generalization is to be expected from a series of separate problems being solved; (2) the idea that one is better or poorer in the performance of a particular task than other members of one's own group. These two ideas were studied both in relation to the changes produced in conscious functioning and behavior at the time of learning and in relation to their value when recall was attempted at a later time. The experiments having to do with the first idea are reported in Part I, and those having to do with the second idea are reported in Part II.

#### 1. Study of "Intellectual Generalization" Attitude

##### A. Introduction to Experiments I, II, and III

##### a. Statement of problem.

The problem of the first series of experiments was to study the effect upon the process of generalization of the idea that a gen-

eralization was to be expected. This necessitated the comparison of the results given with this idea, with results with the same task but with the idea varied. Three variations of the idea were presented. The main problem and type of group were kept constant and comparisons made of the objective learning records. The three variations of this attitude selected were those resulting from the following ideas: (1) no idea other than that given by the nature of the material or the habits of the subject that a generalization was to be arrived at by the subject; (2) an idea given in the form of a verbal instruction that, in addition to solving the individual problems, a generalization was to be expected and looked for; (3) an idea that a generalization was present and that it would be given outright by the experimenter to the subject.

The problem was also to find out whether individuals of different mentalities and different chronological ages reacted in the same manner to these variations of attitude. Also, the experimenter wished to discover the effect of the attitudes when the generalizations have different degrees of complexity with relation to the subjects generalizing.

The problem included the task of selecting appropriate material and of devising a procedure that would bring the attitudes in question under control. It also required that some method be worked out for treating results secured in such a manner as objectively to clarify differences, if such existed, in behavior with the different attitudinal responses.

The subject's task, in every case, was to follow the instruction arranged for the experiment and to solve a definite series of problems.

#### b. Selection of materials.

##### (1) Characteristics demanded of such materials.

It was necessary, in selecting materials for the following experiments, that certain factors should be considered.

(a) Unity: The material selected should possess certain characteristics of unity which would assure the development of a generalization.



(b) Wide range of applicability: The material should be selected with a view to its applicability to individuals varying widely in mentality and chronological age.

(c) Different forms of the same material: The material should be of such a type and so arranged as to allow for the presentation of successive series of the same type, that is involving the same general features. This was necessary in order to allow for continuing the presentation of the same material, until either a generalization had been developed by the subject, or, until such arbitrary time limit as the experimenter felt desirable to place on the learning, had elapsed.

(d) Avoiding variable attitudes already established: The selection of materials should be such as to avoid the recall of concrete situations with variable emotional responses on the part of subjects used. The experimenter found it necessary to discard some of the material that was otherwise of great interest because of the attitudes built up in the responses of the adult subjects to situations having a resemblance to the material in question. This material will be referred to later and its particular attitudinal difficulty elaborated.

(e) Completion within a reasonable time: In order that enough cases might be included to give some statistical validity to the results, the material selected for arriving at a generalization should allow for arriving at the generalization within a reasonable time and with a reasonable number of presentations of the material selected for use.

(f) Should not permit of immediate generalization: The material selected, while not too difficult, should not allow for immediate generalization on the part of the subject being studied. This characteristic is necessary in order that the learning of such material shall afford differential results which shall allow for comparisons of quantitative and qualitative changes in the process of generalizing with the difference of attitude.

## (2) Materials available for use.

Materials possessing some of the characteristics desired had been arranged by Fisher (8) and also by Hull (11). Kuo (73)

used materials resembling these of Hull. The Yerkes' material of the multiple choice type also could be adapted to this purpose (168).

Fisher's material: This material was made up of four serial groups of drawings. The names used to designate these groups were "zalof," "deral," "tefoq," and "kareg." Each group contained 10 drawings. Each drawing was made on a sheet of white cardboard 20.5 cm. by 12.5 cm. Under each drawing the meaningless group name was printed. The 10 cards of each series were bound together in booklet form. Facsimile reproductions of these drawings are given in the appendix to Fisher's experiments (43).

The material just described did not satisfy all of the demands of the present investigation. It offered problems with the unity necessary to assure the development of a generalization, but did not satisfy the demands of wide range of applicability, different series of the same difficulty, and possibility of completion within a reasonable time.

Hull's material: Hull's material was a series of 144 Chinese characters. These characters were taken from the Chinese dictionary and adapted to the purposes of Hull's experiments. The individual characters were drawn in black ink on cards 2 in. by 1 in. They were presented to the subject successively by means of a specially constructed apparatus. The subject responded to each character by speaking a particular nonsense syllable. Twelve series of 12 characters each were arranged. The serial order was a random one. Equality of difficulty was not attempted in the arrangement. Successive sets showed increasing complexity of the extraneous data from which the meaningful elements must be abstracted. Facsimile reproductions are given in Hull's report (53).

Hull's material was very suggestive as was his procedure in presenting the successive members of the series and his method of recording the responses given. Nevertheless, it seemed best to the writer to attempt the production of a different type from that which was described by Hull. Greater simplification was desirable both because of the wide range of applicability due to the differ-



ences of intelligence of subjects to be used, and because of the time limits that the experimenter felt it necessary to set in the learning.

- (3) Materials tried out and discarded as not satisfying the demands of this experiment.

In every case, the point of the arrangement of these materials was to satisfy the demands as outlined. These were; a unifying idea allowing for a generalization, a wide range of applicability, the possibility of arranging as many forms as necessary of the same type of material, completion within a reasonable time, material not permitting of immediate generalization, and material that does not call up emotional associations.

It must be kept in mind that the copy had also to offer some series of individual problems which would hold the attention for their solution. In addition it had to offer the opportunity for generalization. This material, therefore, had to be arranged, either as a series of memory exercises, or as a series of individual reasoning problems. Also, since the problem was to study modifications induced in the process of generalization when variations in the ideational attitude were present, the first problem was to arrange material which offered a process of generalization and at the same time afforded a possibility of recording variations in the process of generalization produced by the different attitudes.

The experimenter wished if possible to use mathematical material, or rather, mathematical exercises involving the evolution of number concepts and relationships. Several forms of arbitrarily arranged number sequences of an algebraic type were tried out with a group of university students and with a group of nine year old children. These groups, used for trying out the various materials were the same kinds of subjects that were used in the main experiments.<sup>1</sup>

A number of factors made the mathematical situations undesirable for use. The chief of these factors were, its too great diffi-

<sup>1</sup> None of the subjects used in trying out materials were used in the main experiments; therefore there was no interference or prepractice on the part of the individuals acting as subjects.

culty for learning in the time allowed, the impossibility of originating enough forms of the same type of material of equal difficulty, and the unsatisfactory emotional response of a large group of university students to this situation because of its resemblance to algebraic experiences which had evidently been unpleasant in a large number of cases.

The attitude of the adult trial group to this mathematical situation was in itself an interesting incidental result of this preliminary work. The subjects reported immediately and spontaneously that this type of material (mathematical) was unpleasant, and several made the statement that they never could do anything with mathematics and therefore possibly never would be able to learn this. Since the same type of algebraic processes had no such response from the children used in the trial group who had yet to go through the experience of acquiring number concepts of the more complex types, it seems that the adult attitude must have developed from continued unsatisfactory experiences in attempting to develop number concepts, thus developing a conditioned emotional response to anything resembling these unpleasant experiences.

The experimenter attempted, by cloaking the mathematical processes in verbal form to overcome the difficulty of emotional attitude on the part of the adult group. The resulting material was still not possible to use because of the time taken to complete the process and the difficulty of arranging methods of scoring that would bring out differences in the mental processes.

The next attempt was to originate some material of a geometrical nonsense type with verbal associations. This was following more closely the procedure of previous investigators. Several excessively difficult forms of this material were tried out and discarded before the materials finally used were selected. Two sets of the more difficult type are reproduced (pp. 24, 26).

On the following pages are given in abbreviated form samples of materials of geometrical type tried out and discarded. These were similar in type to exercises which were adopted.



Samples of materials tried out and discarded as not satisfying the needs of this experiment.

These materials were arranged and tried out in the order in which they are presented. The chief reasons why these materials were not found satisfactory to use were: (1) their too great difficulty, (2) their generalization required too great a time, (3) in some cases they did not allow for duplication in type to produce enough different forms of the same material, (4) some were related to previous unpleasant experiences, as in the case of the mathematical materials with adults, and (5) in some cases the

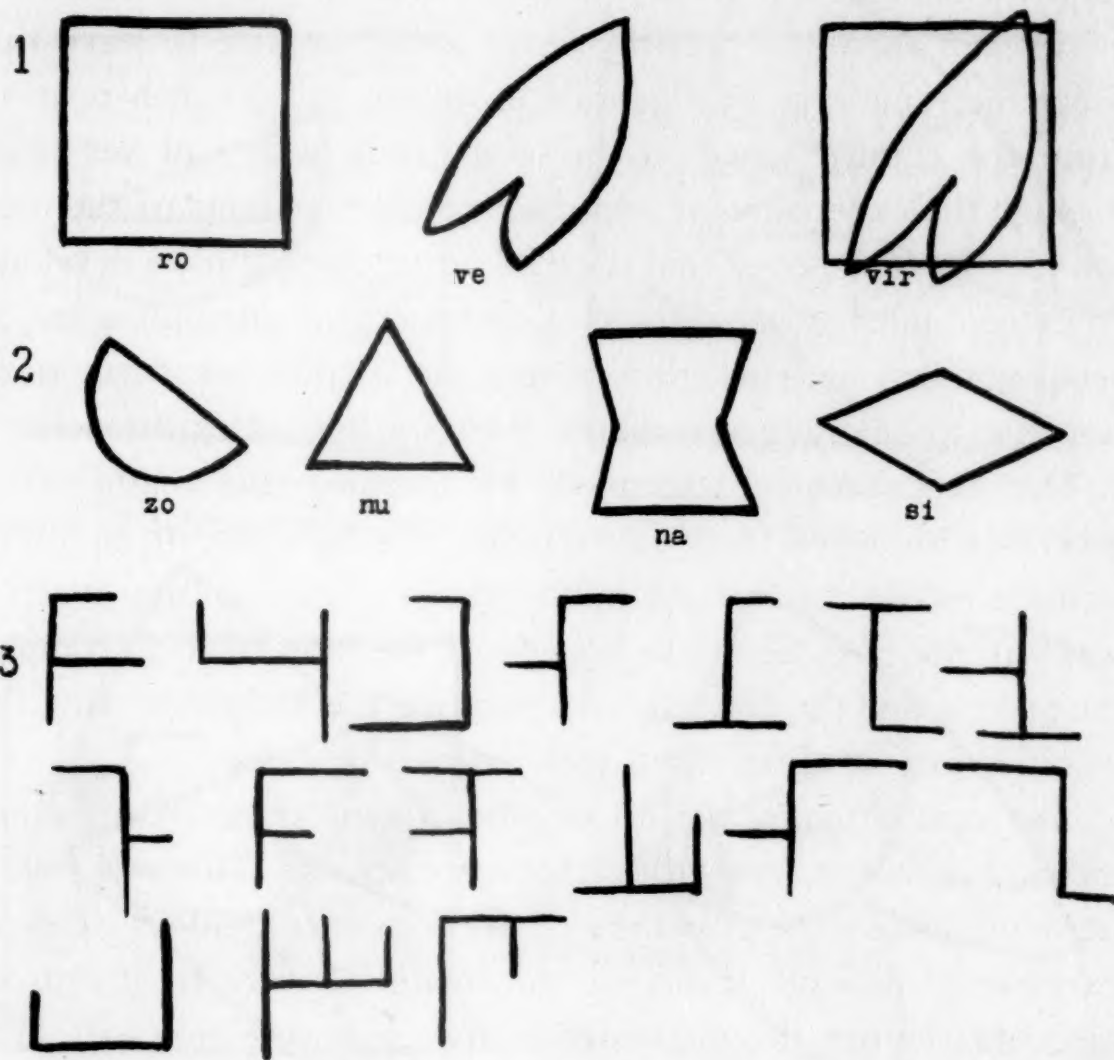


FIG. 1. Meaningful and meaningless figures used in arranging Material E:  
 1. These three figures were related to nonsense syllables. These syllables formed the first syllable of nonsense names.  
 2. These four figures were related to nonsense syllables. These syllables formed the last syllable of nonsense names of which the first were the beginning syllables.  
 3. These figures were introduced as elements to be ignored. (Nonsense memory material from Seashore 173.)

results did not permit of scoring that would make possible comparisons of a quantitative nature.

The raw material is presented here with no description of the manner in which the accompanying attitude could be controlled. This procedure is outlined fully in relation to the material finally selected for use. Samples of the materials of a geometrical type follow. Mathematical materials A, B, C, D, are not reproduced as they were less closely related to the material finally selected.

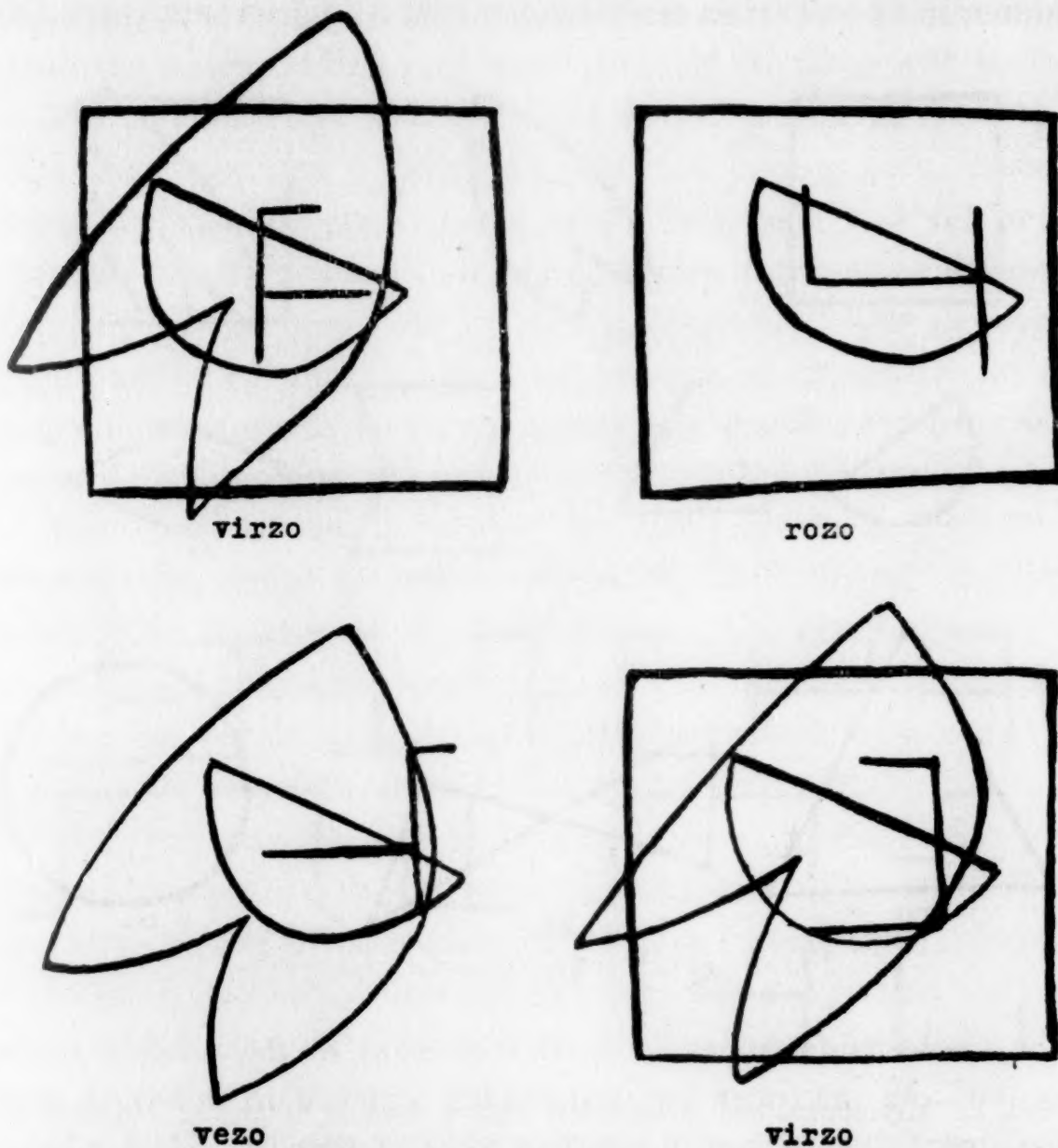


FIG. 2. These figures are illustrations of the individual members of series made from the combinations of nonsense syllables, figures, etc., shown previously. Several series of 15 members each were arranged. Series I was as follows: virzo, vezo, rozo, venu, ronv, virnu, venu, rona, virna, vena, rona, virsi, vesi, rosi, virsi. Samples of figures used.



Material A—Arbitrarily arranged number sequences of algebraic type.

Material B—A different arrangement of the algebraic material allowing for more forms of the same type.

Material C—(I) A special arrangement of memory material. The generalization offered involves simple counting.

Material C—(II) Same arrangement as C (I) in verbal form.

Material C—(III) A second form of the same type as C (I) and C (II).

Material D—(I) An arbitrary arrangement of numbers having a simple addition and subtraction relationship.

Material D—(II) Reproduction of Material D (I) in verbal form.

Material D—(III) Reduction of Material D (II).

Material E—Geometrical nonsense material with verbal associations, not used in experiments described (figs. 1 and 2).

Material F—Same as E but less complicated, not used in experiments described (figs. 2 and 3).

Material F. This material was composed of geometric figures having nonsense names. Three meaningful elements were used. The order in which they were arranged was also significant.

(a) The three figures were related to nonsense syllables (fig. 3). The order in which the syllables occur in a particular nonsense name is determined by the space relation of these three elements.

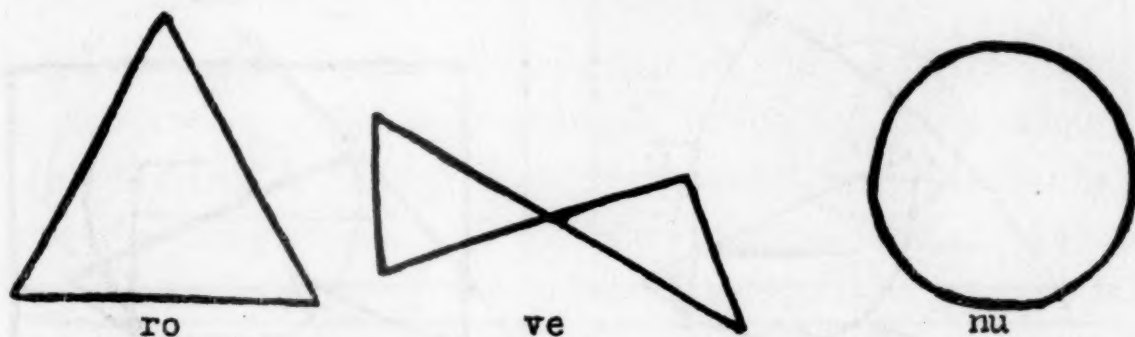


FIG. 3. Forms related to nonsense syllables.

The one outside comes first, the one next to the outside comes second, and the inner one last. This material in modified form was used. The second figure had to be changed to one not overlapping in order to simplify the problem.

(b) The unrelated elements that had to be ignored in arriving at the generalization were: all facts of color, outer irregular bor-

ders, relative size of figures and other irregular lines introduced in the middle of the figures.

(c) Figure 4 reproduces Series I of the material arranged with this plan.

(d) One of the most interesting results in the try out of Material F was that only three of sixteen subjects succeeded in any reasonable time. Two of the three were adults with highest

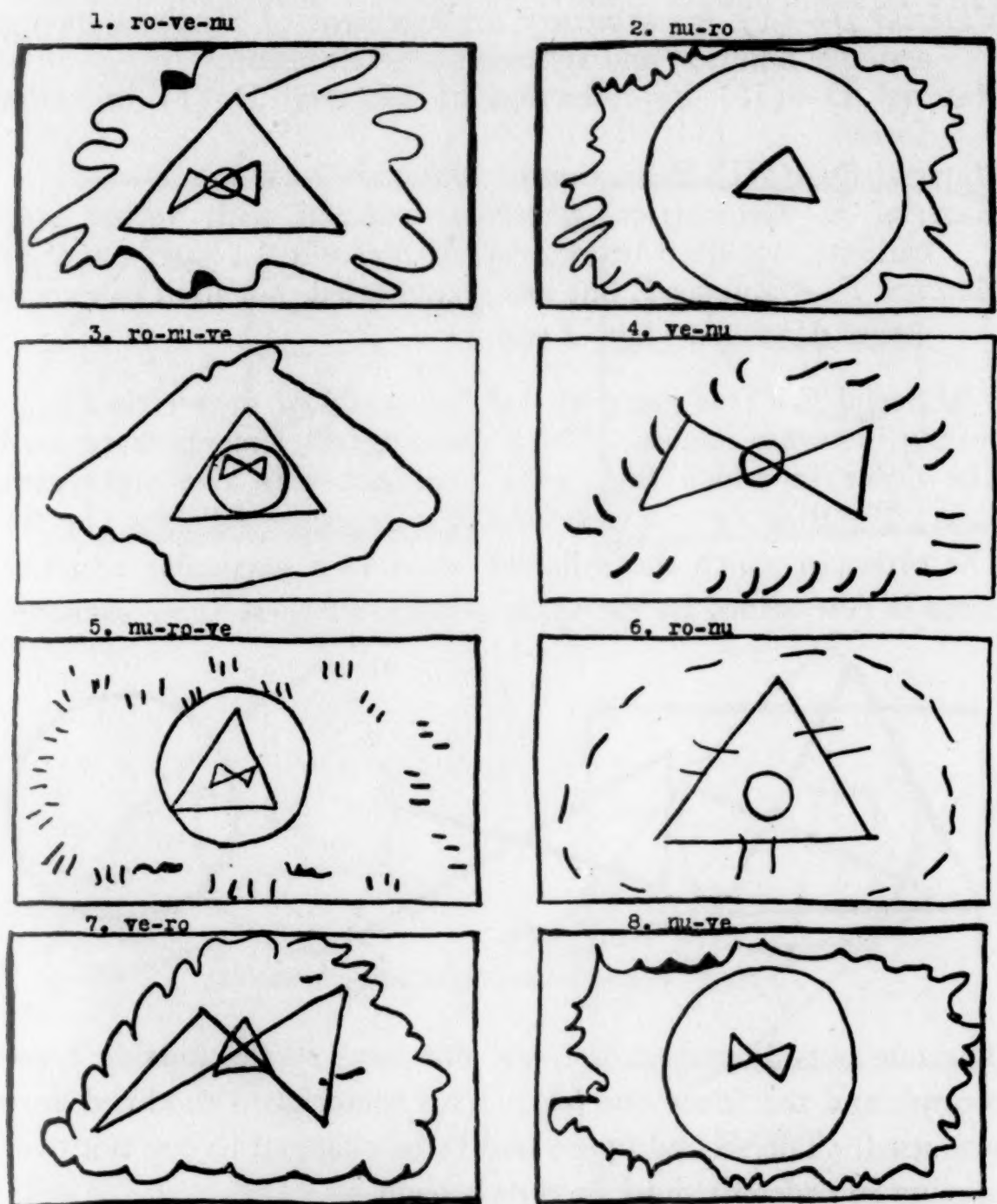


FIG. 4. Series 1—Four series of 8 members each were arranged and tried out. The lines were drawn in color. Two or three colors were used in each drawing.



scores on the Thorndike Group Test and one was a nine-year-old child with an I.Q. of 135. The difference of age seemed less important than the fact of brightness or intelligence as measured by these tests.

(4) Materials finally adopted.

Three sets of generalization materials and two sets of purely memory materials were used in the experiments whose results are reported here. Following the general plan described before for the selection and arrangement of copy and eliminating characteristics which made for dissatisfaction with the materials dis-



FIG. 5. Meaningful characters and their associated nonsense syllables.

carded, the writer finally selected materials which had the following characteristics and were arranged in the following manner:

(a) Material I. The geometric nonsense type of material having verbal associations with geometric figures, and extraneous geometric features introduced to complicate the situation, was the type finally arranged and adopted.

Significant factors: Three meaningful elements were used, each of which was associated with a syllable name. The accompanying figure gives facsimile reproductions of the meaningful characters together with the syllable names related to each.

The second significant factor introduced was the order of the figures and syllables. The order used in this, the simplest form, was from left to right. If no character was allowed to appear

alone in a situation, this would allow for the arrangements of the significant elements shown in fig. 6.

Nonsignificant elements. By introducing extraneous meaningless elements, the appearance of the twelve possible combinations was made to vary. This increased the amount of material and

$\xi H \dots gama$   
 $\xi \bar{H} \dots gasa$   
 $\xi H \bar{H} \dots gamasa$   
 $\xi \bar{H} H \dots gasama$   
 $H \bar{H} \dots masa$   
 $H \xi \dots maga$   
 $H \bar{H} \xi \dots masaga$   
 $H \xi \bar{H} \dots magasa$   
 $\bar{H} H \dots sama$   
 $\bar{H} \xi \dots saga$   
 $\bar{H} H \xi \dots samaga$   
 $\bar{H} \xi H \dots sagama$

FIG. 6. These are the 12 possible combinations of the meaningful elements selected. Order is from left to right.

made the situation, from which the abstraction of meaningful elements was to occur, much more complex. The nonsignificant factors were as follows:

Color: Six colors were used. These were orange, red, yellow, blue, green, and brown. Each of the twelve combinations was reproduced in each of the six colors.

Size: Two different sizes of each combination in each of the six colors was used. A larger and a smaller size was made in each case.

Relative position: The relative distance apart and the position on the card of the elements were varied at random.

An irregular black outer border was drawn on each card.



Resulting combinations: By using 12 meaningful combinations and varying each in color (six colors used) and varying each combination with each color in size (two differences of size), it was possible to produce 144 separate members of the material having the characteristics desired.

Order of members in successive series: The order of members in successive series was arranged by making all of the cards of any one member (for example gasa, see fig. 7), respectively, red, green, blue, orange, yellow, brown, in each of two sizes, large and small. From these 12 packs of cards of the 12 members (random

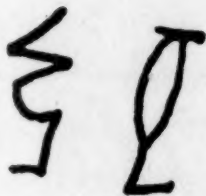


FIG. 7. Characters, called ga-~~za~~.

arrangement of elements within the pack) rearrangements were made which took one from each of the types of syllables with a random arrangement of the color and size of the figure. This resulted in 12 series of materials, each series of which contained each meaningful member once and a random arrangement of the meaningless elements.

Final rearrangement: Placing these 12 series of cards in the order just described, the final arrangement was accomplished by separating the cards in the order in which they occurred at this time, into packs of 8 cards each. This meant taking the first 8 cards of the first series of 12, for series I of the final arrangement, the last 4 cards of the first series of 12 cards and the first 4 cards of the second series of 12, for series II of the final arrangement, etc. The result was 18 series of 8 cards each.

The purpose of this final rearrangement was to produce a series of 8 cards each and to break up any regularity of the names of the members of any particular group. It would not, therefore, be possible to anticipate completely the names to be used in successive series by those used in previous series of the same material.

Final combinations and the order in which they occurred:

The final combinations and the order in which they occurred are reproduced in detail (p. 31).

Note on irregularity: Material I, set I, member 4 and member 5, as originally used, were opposites of one another. This resulted from the method of arrangement described. This was allowed to remain, as the material was used with two groups of subjects, children and adults. It offered valuable information with respect to the nature of the process, showing those who took advantage of the association offered and those not taking advantage of it.

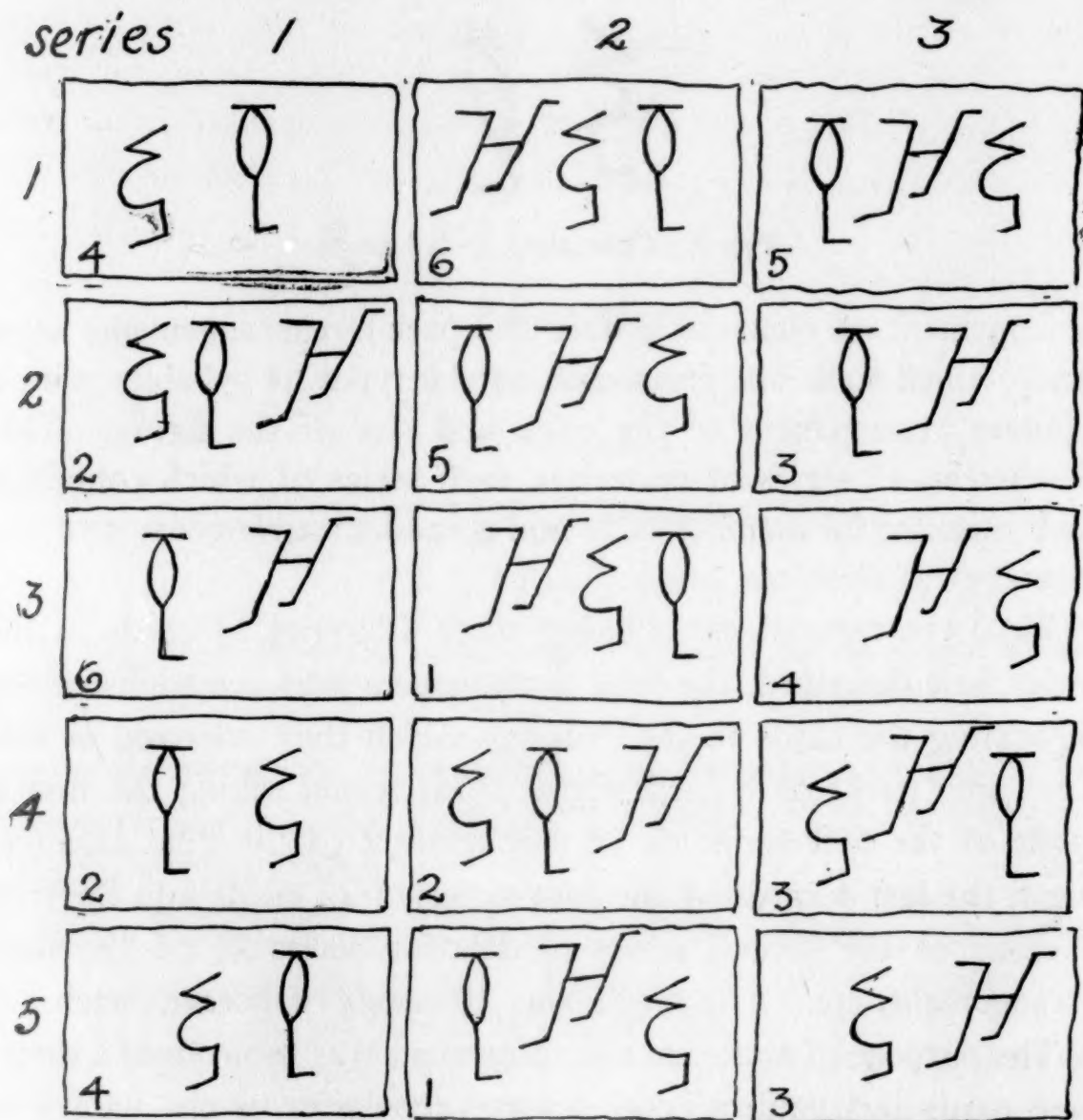


FIG. 8. Meaningful elements. Material I (see Fig. 5). Order significant. Order from left to right.

Meaningless elements: Color, size, relative position. Figures were drawn in color. Numbers indicate colors used. 1—red, 2—green, 3—blue, 4—orange, 5—yellow, 6—brown.



For the third or Adolescent Group, this irregularity was corrected by exchanging one of the members of set 9 with member 5 of the first set.

Size and nature of the material: The nonsense material described was presented on heavy white cardboard sheets 6 in. by 4 in. The nonsense characters together with the irrelevant material were drawn carefully on these cards. The figures were easily and strikingly visible to the subject. The nonsense name of the particular figure was printed at the bottom on the back of each card. It was thus clearly visible to the experimenter as the card was exposed, but not visible to the subject. At the upper left corner of the back of the card was printed the number of the series and following this the number of the card in the series. In addition to the 8 cards of each series a cover sheet of the same type and size of card was used to cover card number one.

Material I. Reproductions of some of the figures in the successive series of this material are given in fig. 8.

| No.<br>Set | 1      | 2      | 3      | 4      | 5      | 6      | 7      | 8      |
|------------|--------|--------|--------|--------|--------|--------|--------|--------|
| 1....      | gasa   | magasa | samaga | maga   | magasa | saga   | gamasa | masa   |
| 2....      | gasama | samaga | sama   | masaga | masa   | samaga | saga   | samaga |
| 3....      | sama   | magasa | maga   | gama   | gasama | gasa   | masaga | gamasa |
| 4....      | saga   | gasama | gamasa | sama   | samaga | magasa | maga   | masaga |
| 5....      | gasa   | samaga | gama   | masa   | gamasa | gasa   | maga   | sama   |
| 6....      | gasama | masa   | gama   | masaga | samaga | saga   | samaga | magasa |
| 7....      | gasama | gamasa | masaga | masa   | maga   | gasa   | sagama | gama   |
| 8....      | sama   | magasa | saga   | gamasa | sama   | samaga | gasa   | samaga |
| 9....      | samaga | gama   | gama   | magasa | saga   | gasama | maga   | masa   |
| 10....     | samaga | sama   | magasa | gamasa | saga   | gama   | gasama | gasa   |
| 11....     | masa   | samaga | masaga | maga   | maga   | gasama | gama   | sama   |
| 12....     | gasa   | masaga | sagama | magasa | masa   | saga   | samaga | gamasa |
| 13....     | sagama | gasa   | masaga | gasama | saga   | gamasa | magasa | sama   |
| 14....     | samaga | gama   | maga   | masa   | gasama | gamasa | masaga | magasa |
| 15....     | gama   | samaga | saga   | gasa   | samaga | masa   | maga   | sama   |
| 16....     | sama   | gasa   | maga   | samaga | saga   | mesa   | gama   | gasama |
| 17....     | samaga | gamasa | masaga | magasa | masa   | gama   | sama   | samaga |
| 18....     | gasa   | gamasa | gasama | saga   | magasa | masaga | maga   | samaga |

(b) Material II. The same geometric nonsense type with verbal associations made up Material II. The chief aim in arranging this material was to keep the idea involved of the same relative complexity but to vary the intricacy of the situation from which the abstraction must be made.

Significant factors: Three meaningful elements were used as

with Material 1. Each of these elements was associated with a syllable name. The order was significant, being the order from left to right. Following are the meaningful characters, together with the syllable name related to each.

The three small lines at the bottom of the picture gave the key to the name. The color of the line was the significant factor:  
 de ——— (blue)      ke ——— (red)      le ——— (green)

There are twelve possible combinations of these elements, if no character is allowed to appear except in combination with at least one other character. The following are the twelve possible combinations:

|        |                         |        |                         |
|--------|-------------------------|--------|-------------------------|
| deke   | <i>blue, red</i>        | kelede | <i>red, green, blue</i> |
| dele   | <i>blue, green</i>      | kedele | <i>red, blue, green</i> |
| dekele | <i>blue, red, green</i> | lede   | <i>green, blue</i>      |
| deleke | <i>blue, green, red</i> | leke   | <i>green, red</i>       |
| kele   | <i>red, green</i>       | ledeke | <i>green, blue, red</i> |
| kede   | <i>red, blue</i>        | lekede | <i>green, red, blue</i> |

The order of reading is from left to right.

Nonsignificant elements: In the same manner as with Material 1, by introducing extraneous elements that have no meaning for the situation, the appearance of these elements may be made to vary and the number of possible different complications from which the abstraction is to be made may be indefinitely increased. The nonsignificant features introduced to complicate the situation were as follows: (1) Twelve of the figures used by Seashore for memory material were used (173); (2) the colors of figures were varied. Six colors were used, namely, brown, violet, red, yellow, green, blue.

Each of the 12 nonsignificant figures appeared 12 times, each of the six colors was used twice.

Resulting combinations: Each of the meaningful elements appeared once with each of the 12 different figures and a random order of the colors of these figures. The final combinations resulting were 144. These were arranged in 12 series of 12 cards each. The series contained each meaningful combination once.



Final rearrangement: The final rearrangement was the same as that described as used with Material 1. Sets of 8 cards were selected. These final combinations and the order in which they occurred are reproduced below.

Size and nature of the material: The material described was drawn carefully on white cardboard sheets 6 in. by 4 in. The nonsense name was printed clearly on the back at the bottom of the card so as to be visible only to the experimenter. The number of the series and the number of the card in the series was placed over card 1 of each series.

Material II. Facsimile reproductions of some of the figures are given in fig. 9 (p. 34). The names related to the successive figures are as follows:

| No.<br>Set | 1      | 2      | 3      | 4      | 5      | 6      | 7      | 8      |
|------------|--------|--------|--------|--------|--------|--------|--------|--------|
| 1....      | deleke | leke   | lekede | deleke | kele   | dekele | lede   | deke   |
| 2....      | kede   | ledeke | kedeke | dele   | dekele | kelede | dele   | deleke |
| 3....      | deke   | kede   | kedeke | leke   | lekede | lede   | ledeke | kele   |
| 4....      | kele   | deke   | lekede | dele   | kelede | kede   | kedeke | ledeke |
| 5....      | leke   | dekele | deleke | lede   | kedeke | lekede | lede   | ledeke |
| 6....      | kelede | deke   | kele   | deleke | leke   | kede   | dele   | dekele |
| 7....      | kedeke | lede   | leke   | lekede | deke   | ledeke | dele   | kede   |
| 8....      | kele   | kelede | dekele | deleke | kele   | kede   | deleke | lede   |
| 9....      | kedeke | kelede | deke   | ledeke | dele   | lekede | leke   | dekele |
| 10....     | kede   | kelede | ledeke | kele   | dele   | deleke | deke   | lede   |
| 11....     | dekele | kedeke | leke   | lekede | dekele | lekede | lede   | kele   |
| 12....     | kedeke | ledeke | kelede | dele   | leke   | deke   | deleke | kede   |
| 13....     | kele   | kede   | deke   | lekede | leke   | kedeke | dekele | lede   |
| 14....     | deleke | kelede | dele   | ledeke | kede   | leke   | kele   | ledeke |
| 15....     | dele   | lede   | lekede | deke   | kedeke | kelede | dekele | deleke |
| 16....     | kelede | kedeke | dekele | ledeke | deleke | deke   | kele   | lede   |
| 17....     | lekede | kede   | dele   | leke   | lekede | kede   | kelede | kedeke |
| 18....     | lede   | kelede | dekele | dele   | ledeke | leke   | deke   | kele   |

(c) Material III. This material was of the same type as Material I and Material II, except that the complexity was increased in order that the problem of abstraction might be more difficult.

Significant factors: Three meaningful elements were used. Each element was associated with a syllable name. The meaningful elements together with the syllable name related to each are shown in fig. 10 (p. 35).

Order of occurrence of the elements was also significant. The

Series 1

2

3

|   |  |  |  |
|---|--|--|--|
| 1 |  |  |  |
| 2 |  |  |  |
| 3 |  |  |  |
| 4 |  |  |  |
| 5 |  |  |  |
| 6 |  |  |  |

FIG. 9. *Meaningful elements. Material II.* The two or three small colored lines at the bottom of each figure. Each color of these lines is related to a syllable name.

blue—de      green—le      red—ke

*Meaningless elements.* The figures above the small lines are meaningless. Their color is also meaningless. The first member is *dekele*.

*Key to colors.* Numbers above refer to figures. Numbers below refer to small lines. 1—red, 2—green, 3—blue, 5—yellow, 6—brown, 7—violet.



order was from the outside toward the center. The 12 possible combinations of the elements are shown in fig. 11.

Nonsignificant elements: Extraneous elements were introduced to complicate the situation. The nonsignificant elements were as follows:

Colors were introduced in great variety. The only regularity in the introduction of this factor was to make the colors of the

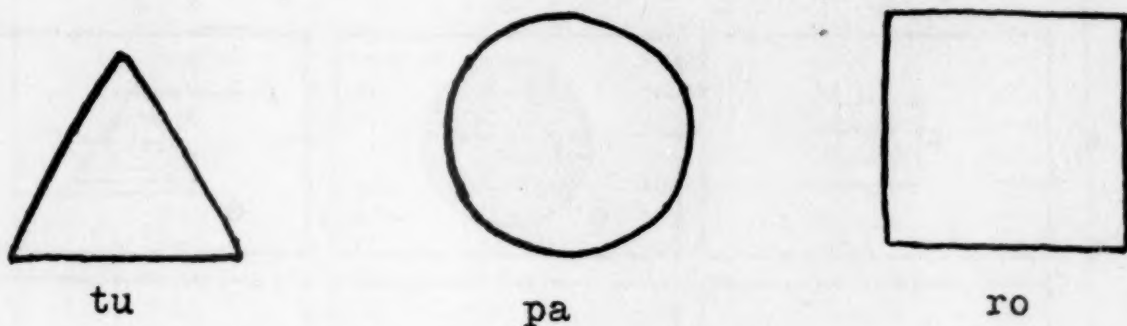


FIG. 10. Meaningful characters and their associated nonsense syllables.

three-syllable word figures solid and those of the two-syllable word figures in outline.

In the case of the two-syllable word figures, an outer irregular rectangular border was introduced. This had to be ignored.

Resulting combinations: Enough different color combinations were introduced irregularly to allow for the appearance of each of the 12 possible combinations of meaningful elements 9 times.

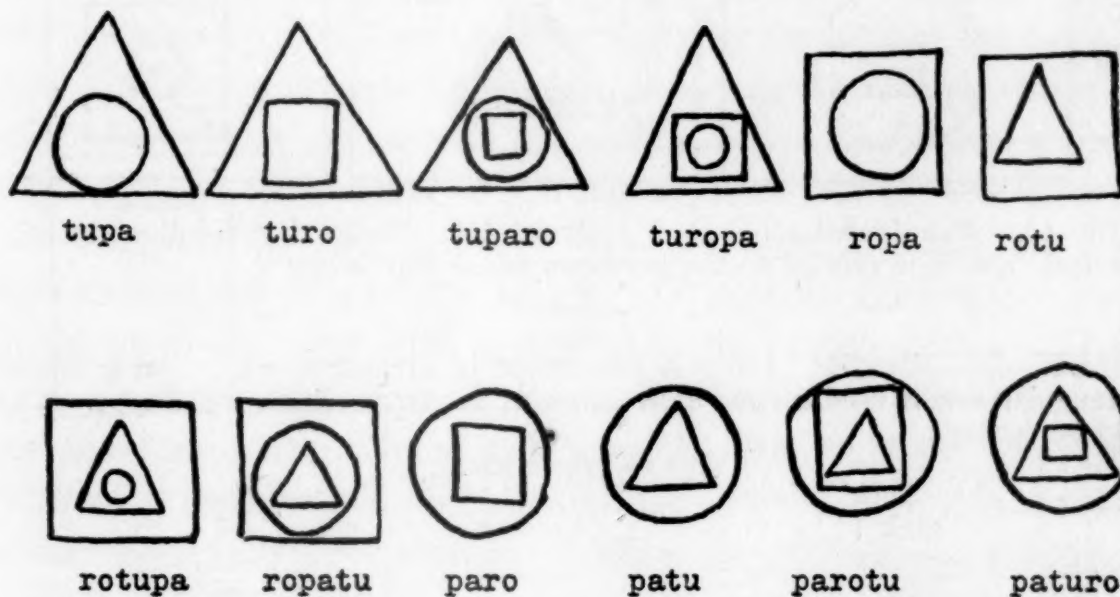


FIG. 11. Showing the arrangement of the meaningful characters in the construction of the nonsense words.

These were arranged in 9 series of 12 cards each. Each such series contained in different random orders one each of the 12 possible combinations of elements.

Final rearrangement: These series of 12 were divided into series of 6 cards each. Thus 18 series of 6 members each were furnished.

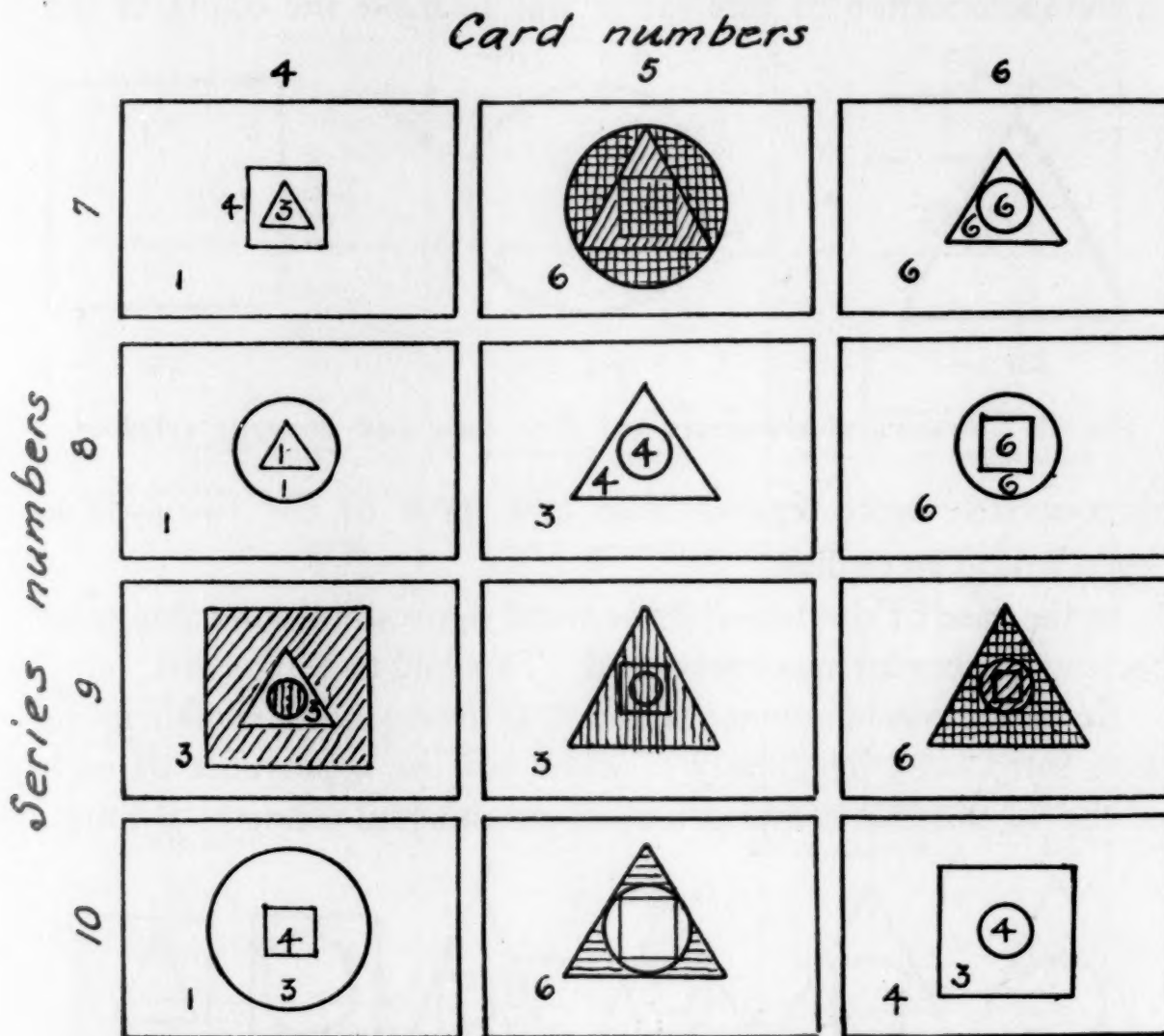


FIG. 12. *Meaningful elements. Material III.* Each of the following geometrical figures is related to the nonsense name just below it.

|    |    |    |
|----|----|----|
| △  | ○  | □  |
| tu | pa | ro |

*Meaningless elements.* Color is introduced in a random way. An irregular rectangular line is used around each figure of the two syllable word type. This is to be ignored.

*Key to colors used:*

*Solid colors*

|        |       |
|--------|-------|
| pink   |       |
| yellow | ===== |
| blue   | ///// |
| brown  | +++++ |

*Colored lines*

|        |    |
|--------|----|
| red    | —1 |
| blue   | —3 |
| brown  | —6 |
| orange | —4 |



Size and nature of the material: The figures described were drawn carefully on white cardboard sheets 6 in. by 4 in. and arranged in series as described for Materials I and II.

Material III. Facsimile reproductions of a few figures in the successive series of this material are reproduced in fig. 12 (page 36), and the names related to the successive figures are as follows:

| No.<br>Set | 1      | 2      | 3      | 4      | 5      | 6      |
|------------|--------|--------|--------|--------|--------|--------|
| 1.....     | tuparo | rotu   | parotu | patu   | paro   | turo   |
| 2.....     | tuparo | rotupa | ropa   | ropa   | paro   | turo   |
| 3.....     | ropatu | tupa   | turopa | patu   | paturu | rotu   |
| 4.....     | rotu   | paro   | ropa   | turo   | tuparo | tupa   |
| 5.....     | parotu | paturu | patu   | rotu   | tuparo | paro   |
| 6.....     | patu   | ropatu | tupa   | turo   | ropa   | rotupa |
| 7.....     | patu   | ropatu | paro   | rotu   | paturu | tupa   |
| 8.....     | turo   | ropa   | parotu | patu   | tupa   | paro   |
| 9.....     | ropa   | turo   | rotu   | rotupa | turopa | tuparo |
| 10.....    | rotu   | turo   | patu   | paro   | tuparo | ropa   |
| 11.....    | turopa | tupa   | parotu | turo   | rotu   | ropa   |
| 12.....    | paro   | patu   | paturu | rotupa | tupa   | ropatu |
| 13.....    | patu   | rotu   | tuparo | ropatu | ropa   | tupa   |
| 14.....    | paro   | paturu | turo   | rotu   | turo   | paro   |
| 15.....    | tupa   | patu   | parotu | turopa | ropa   | rotupa |
| 16.....    | turo   | paturu | paro   | rotu   | patu   | turopa |
| 17.....    | tupro  | ropa   | tupa   | turo   | patu   | ropatu |
| 18.....    | rotupa | ropa   | parotu | tupa   | paro   | rotu   |

(d) Material of a purely memory type used for comparative purposes. It was thought desirable to use, along with the material of a type allowing for generalization, some type of purely memory material. This would allow for comparison of the two processes and for checking on control of memory in the groups used. The type of material chosen for this purpose was the ordinary type of nonsense syllable series well known in the psychological laboratory. The same method of arranging these series was used as that described by Ebbinghaus (38). A vowel between two consonants was the unit of the series. All possible three-letter combinations of this sort were arranged by the experimenter. These were typed on small slips of paper. The experimenter then drew out these syllables, which had been shuffled together in a box, discarding those which had obvious associations. In this manner a number of satisfactory series of nonsense syllables was arranged.

Two series of such nonsense syllables, used in these first three experiments, contained 8 syllables each. The two series that were

used throughout and on which learning results are reported are as follows:

Nonsense Syllable Series I

HOX CEK PAF MER DOF TEH XIS BAJ

Nonsense Syllable Series II

BWG KIM LIR VAP MAJ NUZ GAQ NEH

Booklet used for presentation of syllables: Nonsense syllables described were arranged in booklet form. These booklets were of the type described by Fisher as worked out under Baird's direction. The booklets were made of white cardboard pages 6 in. by 9 in. The individual letters of the syllables were of 1 in. black type, the letters being pasted on the cardboard sheets 1 in. apart horizontally in the center of the page. A cover sheet was used. Indentations were cut in each card to allow for easily turning the successive pages. The separate pages of the booklet were fastened together with gummed tape as described by Fisher (43, 171).

(e) Mental tests used in equating groups. In equating groups on the basis of intelligence for the purposes of this investigation, the Thorndike Intelligence Examination for High School Graduates (175) was used in the case of the university students and the Stanford Revision of the Binet-Simon Test (174) in the case of the two other groups studied. All intelligence records are given in terms of one or the other of these two tests.

c. Groups used as subjects.

Three groups of subjects were used in the experiments reported here. They are referred to in Experiment I as Children, in Experiment II as Adolescent Group, and in Experiment III as Adult Group.

(1) Children; general nature of this group: This group consisted of 39 third-grade children, of whom 26 were boys and 13 were girls. The mean of chronological ages for this group was 9.1 years, with a range from 8.1 years to 10.5 years and a



standard deviation for the group of .625 years. The mean of mental ages (Binet-Simon, Standard Revision) for the group was 10.1 years with a range from 7.6 years to 13.5 years and a standard deviation for the group of 1.15 years. The mean of intelligence quotients was 112.4 with a range from 86.6 to 145.7 and a standard deviation of 14.0 points.

(2) Adolescent; general nature of the group: This group consisted of 48 boys at the Whittier State School. The mean of chronological ages for this group was 15.8 years with a range from 15.5 years to 16.5 years. The standard deviation for this group was .278 years. The mean of I.Q.'s for this group was 79 with a range from 56<sup>1</sup> to 98. The standard deviation was 9.9 points. The I.Q. rather than the mental age was used here because in some cases the I.Q. was the grade recorded where the test record was sent with the boy. Since the chronological age range was so narrow, the equating in I.Q. indicated an equation in mental age. The mean of mental ages would be 12.6 years with a range from 8.9 years to 15.6 years.

(3) Adult; general nature of this group: As originally selected this group consisted of 30 subjects. Each member of this group was of senior or graduate standing and had taken two or more quarters of work in general or experimental psychology or both. Due to the unavoidable absence of the experimenter for the last two weeks of the quarter in which this part of the experiment was carried on, the work was not completed in all of its detail. Therefore, the final group consists of 17 subjects, 8 women and 9 men. The mean of scores, on the Thorndike Intelligence Examination for High School Graduates, which test had been given upon their entrance to the university, was 79.4 with a range for the group from 55.9 to 105.7. The standard deviation was 13.6 points, and the chronological age range from 18 to 21 years.

<sup>1</sup> This range does not represent the population of the State School at Whittier. The boy with 56 I.Q. was kept only temporarily until his low mentality was discovered. Also the particular sixteen-year-old group selected for this experiment did not include the highest intelligence scores in the school.

d. Procedure in these experiments.

(1) General outline of procedure. The different groups described above were taught the materials referred to as Material I, Material II, and Material III, in the following manner: The experimenter sat at a table opposite the subject. The room was well lighted and quiet. In the case of the children the work was done in a quiet basement room in the Palo Alto schools and in a small outdoor school room at the Palo Alto Military Academy. The children were sent for in the order and at the time desired by the experimenter. The work with the adult group was conducted in a laboratory room arranged for that purpose. In the case of the Whittier group the work was done at the State School in one of the small rooms in the Research Department.

The experimenter gave the subject the particular instruction applicable to the variation in attitude being studied (p. 41). Material I, II and III, Instruction I (Method I, p. 41), Set 1 of the particular material being learned were presented in the order shown in the tables of the materials (pp. 31, 33, 37). Each card in the series being learned was exposed for a 5-second interval. At approximately the middle of the interval, the name of the picture was pronounced by the experimenter. The name was read from the back of the card being shown.

The timing was done with a stop watch, which was placed near the experimenter on the table. A silent pendulum had been tried out, but it was found that the stop watch, both as an auditory and as a visual stimulus, was better, as well as being easier to transport and use under the varying conditions of the experiment. Presenting the series of cards for 5-second intervals took 40 seconds to present one series of Materials I or II, and 30 seconds of Material III. An interval of 20 seconds was allowed between the successive trials or presentations of the same series. After the first presentation, the subject was instructed to attempt the pronunciation of the name before the experimenter. The series was considered learned when each name of the entire series could be pronounced correctly in the interval allowed, in two successive presentations. The generalization was considered formed when



an entirely new series could be named correctly twice in succession, that is on the first two presentations of the series. This is a simplification of the procedure described by Hull (53).

(2) Method of recording results. Each response was recorded on a record sheet within the view of the subject on the table in front of the experimenter and within the view of the subject. A plus sign indicated a correct anticipation of the name, a minus sign indicated an incorrect anticipation or an omission.

(3) Control of attitude by instruction. The following variations in instruction were used to stimulate the particular attitudinal response being studied. These variations in instruction are referred to as Method I, Method II, Method III.

Method I. The subject was instructed to *learn the names of the members* of the particular series being shown to him. He was told to notice the pictures so that he could remember them when he saw them again. Also he was particularly instructed to attempt to say the name before the experimenter as soon as possible.

Method II. The subject was given the same instruction as in Method I with the added instruction that he was to *notice common elements* in successive pictures and to keep in mind the idea that a generalization was possible and could be found if looked for.

Method III. This method differed from Methods I and II in that it was a demonstration by the experimenter of the generalization using the successive presentations of the material as illustrations. The number of such presentations had to be determined arbitrarily by the experimenter; therefore, in each case, the number of presentations by this method was the same for all of the members of the particular group studied. The attempt was to give such a number of repetitions as would make the results with this method comparable with those by Methods I and II. The check used on the attention of the subject during this process was to require that he correct two errors of pronunciation on the part of the experimenter, which errors had been intentionally inserted in the third and last trial. Also, he was required, at the end of the number of presentations arbitrarily decided upon, to give the name of the first two members of the next series. In

no case, of any of the groups used, was the subject unable to do this. The purpose of this control was to assure the experimenter that the subject was attending throughout.

The number of presentations with Method III was, for the Group of Children with Material 1, 10 successive presentations of Series I, II, and III. This gave 30 trials in all. For the Whittier Group, with Materials I and II, the number of presentations was 3 successive presentations each of Series I, Series II and Series III and 1 presentation of Series IV. This gave 10 trials in all. For the adult group, with Materials I, II, and III, the number was 3 successive presentations each of Series I and II, making 6 trials in all.

(4) Method of presenting purely memory material. The Nonsense Syllable Series I (p. 38) was taught in the following manner: Each syllable was presented for 5 seconds. The exposure was allowed by turning the successive pages of the booklet described (p. 38). At the end of the exposure of the entire series, the subject was required to pronounce the syllables in the order remembered. In reproducing the series orally, it was required of the subject that he give the individual letters of each syllable, as H-O-X, C-E-K, etc. As the subject reproduced the series, the experimenter recorded the exact response on the record sheet arranged for this purpose. The record sheet in this case was not in the view of the subject but behind the booklet used for presenting the syllables.

(5) Method of scoring results. Two types of scoring of the results from the generalization Material I, II, and III and of the results with the memory material were adopted. A score was given on each successive trial. This allowed the plotting of learning curves from the individual records or from the combined records of subjects. A second score was obtained by adding in a horizontal direction the number of times the response to a member, in a particular position in the series, was correct. By dividing this last number by the number of trials, a percentage score was obtained for that member in the series with the material and the particular subject. This score proved useful in compar-



ing the value of different positions in the series with variations in attitude on the part of the subject.

Discussion of second type of scoring. In material of a purely memory type the value of a position can be measured by a comparison of the per cent. of times a syllable in any given position in the series is correct with the per cent. of times other syllables in the series are correct. Such comparisons have been made by earlier workers using other methods, and it has been found that the first and last syllables have preference over the middle syllables in a series. Such results have not been worked out with a great degree of precision.

In material in which the series is not of the memory type, the writer believes that the variation in the percentage values of the different positions in the series is useful as a measure of generalization and tendency to develop associations. In purely nonsense material, on the other hand, the only thing giving preference to a particular member in the series is some advantage of position; in a series where generalization is possible and occurring, involving organization as a whole, the particular value of a member because of its position or because of its individual characteristics is subordinated to the generalization occurring. Thus the successive members in a generalization series would tend to have the same value as far as learning was concerned. Therefore the mean deviation of the percentage values of the different members in the series, obtained in the manner described, should be a measure of the generalization occurring in the process. If the mean deviation is large, the amount of generalization is small; if the mean deviation is small, *and learning is going on*, the generalization occurring predominates over the purely memory response. The writer considers this measure valid only when learning is going on and when the material is neither too easy nor too difficult for solution by the subject to whom it is presented.

Discussion of the first type of scoring. The score on successive trials, in the case of nonsense syllables, took account of partially correct responses. A total score of 24 was used. This allowed for a score of 3 on each syllable in the series. If 2 of the 3 letters were correct, a score of 2 was given. If the series was

entirely correct, except for order of the syllables, a score of 23 was given. The same procedure was used in summing the times a syllable in a particular position in the series was correct. If a syllable had been correct 5 times out of 10 trials and two-thirds correct 3 other times, a score of 7 was given. With 10 trials to learn the series this gave a particular syllable a percentage value of 70 per cent., that is, it had been correct 70 per cent. of the times during the learning of the entire series. If the syllable series contained 10 syllables instead of 8, as was the case with the adult group material in Part II of this report, a score on a single trial could reach 30.

With the generalization Material I, II, and III, this first type of scoring was used, but the total score was 8. No attempt was made to record responses other than a perfect response.

(6) Method of treatment of results. The results, recorded and scored as described, were treated in the following manner: Individual learning curves were plotted. Some of these which have a particular value for comparative purposes are reported. Learning curves which represent the means of scores on successive trials for the particular groups with each of the materials and attitudes studied were also plotted. These have statistical validity sufficient in most cases to be used as evidence of a likeness or difference in the processes studied.

Graphic representations of the variations of individual and group performance with reference to position preference in a series with the different types of materials, different attitudes, and different groups studied, were made.

Tabular arrangements of results, showing the details of facts with reference to the number of trials taken in learning and recall with the different materials, attitudes, and groups, were made and, where the facts proved significant, are included here.

## B. Experiment I with Children

### a. Statement of problem.

The problem here was to study the effect of the attitudes outlined upon the process of generalization in the case of nine-year-



old children. These attitudes were those represented by the following ideas: (1) No idea suggested that the material worked with or the problem set offers possibility of generalization; (2) the idea that a generalization is to be looked for; (3) the idea that the material offers a generalization that will be given outright by the experimenter using the successive separate problems to demonstrate this generalization.

b. Materials.

The materials were: First, the material described on pages 27-31 and referred to as Material I throughout this discussion; second, the first series of nonsense syllables described on page 38, presented in booklet form as described (p. 38); third, the Stanford Revision of the Binet-Simon Tests; fourth, record sheets.

c. Instruction given to control the attitude.

The instructions given to bring about the attitude to be studied are referred to as Method I, Method II, and Method III (p. 41). As given to the group of children, these instructions were as follows:

Method I (no idea that a generalization is to be expected).

"I am going to show you some cards with pictures on them. The first time that I show the cards I will say the name of each picture when I show the card. I want you to learn the names of these pictures. After the first time you are to try to see if you can remember the name and say it before I say it for you. Look carefully at the pictures so that you will remember the name. I will keep on showing you the pictures and saying their names until you can say all of the names before I say them. When you have learned the names of these pictures, I will show you some more pictures whose names you will learn."

Method II (the idea that a generalization is to be sought).

The instruction here was the same as for Method I, with the addition of the following: "There is something alike about these

pictures that gives them the name that they have. You are to remember to look for something alike in the different pictures whose names you are learning."

Method III (the idea given outright and demonstrated).

"I am going to show you some cards with pictures on them. The names belong to something in the picture which I will show you. 'Ga' is the name of this part (pointing to part); 'ma' is the name of this part; 'sa' is the name of this part. This picture is called *gamasa* because *ga* comes first in the picture, *ma* comes next, and *sa* comes last. Now I will say the names of these pictures to you several times so that you will know them when you see them again. If I make a mistake you are to tell me about it" (two errors intentionally inserted in second presentation to check on attention).

#### d. Subjects.

Thirty-nine children, 26 boys and 13 girls, acted as subjects in this experiment. The mean of chronological ages for the group was 9.1 years, with a standard deviation of .652 year, and a range from 8.1 to 10.5 years. The mean of intelligence quotients for the group was 112.4, with a standard deviation of 14.0 points, and a range from 86.6 to 145.7. The mean of mental ages was 10.1 years, with a standard deviation of 1.1 years, and a range from 7.6 years to 13.5 years.

The intelligence quotient rather than the mental age is used for arrangements in terms of mentality in order that slight differences in time of giving the original mental tests should not come into the situation. All of the mental tests were given to this group within six weeks of the time that the experimental work was done. In this group the mental tests were given by the experimenter, except in the case of four subjects. These four subjects were tested by Mr. Snow, a graduate student in educational psychology at Stanford University.

Method of arranging equal mentality groups: The total group mentioned above was the basis for a selection of three groups of



TABLE I

Representing the three groups as finally arranged, giving an equation of I.Q., Mental Age, and Chronological Age.

| Group A             |        | Mental Age |      | Chron. Age |      | Sex |
|---------------------|--------|------------|------|------------|------|-----|
| Case No.            | I.Q.   | yrs.       | mos. | yrs.       | mos. |     |
| 28.....             | 86.6   | 8          | 8    | 10         | 0    | M   |
| 1.....              | 87.0   | 8          | 6    | 9          | 9    | M   |
| 29.....             | 99.2   | 10         | 4    | 10         | 5    | M   |
| 2.....              | 103.6  | 9          | 7    | 9          | 3    | M   |
| 3.....              | 105.1  | 10         | 4    | 9          | 10   | M   |
| 4.....              | 106.5  | 9          | 0    | 8          | 5    | F   |
| 30.....             | 112.8  | 9          | 6    | 8          | 5    | M   |
| 5.....              | 115.5  | 9          | 11   | 8          | 7    | F   |
| 6.....              | 116.0  | 9          | 8    | 8          | 4    | M   |
| 7.....              | 118.7  | 10         | 7    | 8          | 11   | F   |
| 8.....              | 125.7  | 10         | 2    | 8          | 9    | F   |
| 9.....              | 138.0  | 11         | 3    | 8          | 2    | M   |
| 31.....             | 145.7  | 13         | 6    | 9          | 8    | M   |
| <hr/>               |        |            |      |            |      |     |
| Means.....          | 112.3  | 10.07 yrs. |      | 9.11 yrs.  |      |     |
| Standard error..... | 16.76  | 1.20       |      | .72        |      |     |
| Standard error..... | M-4.64 | .33        |      | .199       |      |     |
| <hr/>               |        |            |      |            |      |     |
| Group B             |        |            |      |            |      |     |
| 10.....             | 94.0   | 8          | 8    | 9          | 3    | M   |
| 32.....             | 98.4   | 10         | 3    | 10         | 5    | M   |
| 11.....             | 102.0  | 9          | 6    | 9          | 3    | F   |
| 12.....             | 104.8  | 9          | 0    | 8          | 7    | F   |
| 33.....             | 106.8  | 9          | 1    | 8          | 6    | M   |
| 13.....             | 107.6  | 10         | 7    | 9          | 10   | F   |
| 14.....             | 108.4  | 9          | 8    | 8          | 11   | M   |
| 34.....             | 116.5  | 10         | 0    | 8          | 7    | M   |
| 15.....             | 117.5  | 11         | 1    | 9          | 6    | M   |
| 16.....             | 121.5  | 10         | 10   | 8          | 11   | F   |
| 35.....             | 123.8  | 10         | 10   | 8          | 9    | M   |
| 17.....             | 125.6  | 11         | 2    | 8          | 11   | F   |
| 18.....             | 134.9  | 11         | 7    | 8          | 7    | M   |
| <hr/>               |        |            |      |            |      |     |
| Means.....          | 112.4  | 10.17 yrs. |      | 9.07 yrs.  |      |     |
| Standard error..... | 11.45  | .89        |      | .543       |      |     |
| Standard error..... | M-3.17 | .24        |      | .150       |      |     |
| <hr/>               |        |            |      |            |      |     |
| Group C             |        |            |      |            |      |     |
| 36.....             | 89.3   | 7          | 8    | 8          | 7    | M   |
| 19.....             | 96.0   | 9          | 4    | 9          | 9    | M   |
| 37.....             | 100.0  | 10         | 6    | 10         | 6    | M   |
| 20.....             | 103.0  | 9          | 5    | 9          | 2    | M   |
| 21.....             | 104.2  | 8          | 3    | 8          | 4    | M   |
| 22.....             | 107.2  | 9          | 10   | 9          | 2    | F   |
| 23.....             | 111.9  | 10         | 11   | 9          | 9    | F   |
| 24.....             | 117.0  | 9          | 10   | 9          | 2    | M   |
| 38.....             | 118.3  | 9          | 8    | 8          | 2    | M   |
| 25.....             | 123.8  | 10         | 10   | 8          | 9    | F   |
| 26.....             | 126.4  | 10         | 9    | 8          | 6    | M   |
| 27.....             | 127.0  | 10         | 7    | 8          | 4    | F   |
| 39.....             | 137.7  | 13         | 1    | 9          | 6    | M   |
| <hr/>               |        |            |      |            |      |     |
| Means.....          | 112.4  | 10.04 yrs. |      | 9.04 yrs.  |      |     |
| Standard error..... | 13.55  | 1.29       |      | .665       |      |     |
| Standard error..... | M-3.75 | .35        |      | .184       |      |     |

equal mentality. This was desirable in order that we might eliminate, by initial control in the arrangement of subjects in groups, the factor of intelligence as explanatory of differences in performance.

The total group was arranged in order of intelligence quotients. Three groups were made by selecting from the order given in succession for each of the three groups. The procedure was as follows: The subject with the highest I.Q. was selected for the first member of Group I, the subject with the next highest I.Q. for the first member of Group II, and the subject with the second highest I.Q. for the first member of Group III. For the second member of each of these three groups the procedure was reversed. The subject highest on the list remaining was made the second member of Group III, the next in order the second member of Group II, and the next in order the second member of Group I. This process of selection was repeated until the group was exhausted. The groups finally arranged are shown in Table I.

The following standard errors of differences of means show that the differences in chronological age, mental age, and I.Q. cannot be considered significant if comparisons are made of the groups using the means for such comparison (Table II).

TABLE II  
Standard Errors of Differences of Means of Mental Age, Chronological Age, and I.Q. of Groups A, B, and C.

| I.Q.                 |          | Mental Age           |         | Chron. Age           |          |
|----------------------|----------|----------------------|---------|----------------------|----------|
| Standard Error Diff. |          | Standard Error Diff. |         | Standard Error Diff. |          |
| of Differences       |          | of Differences       |         | of Differences       |          |
| of Means             |          | of Means             |         | of Means             |          |
|                      | Diff.    |                      | Diff.   |                      | Diff.    |
| M(A)M(B)             | 5.61 .10 | M(A)M(B)             | .40 .10 | M(A)M(B)             | .249 .04 |
| M(A)M(C)             | 5.96 .10 | M(A)M(C)             | .53 .02 | M(A)M(C)             | .271 .07 |
| M(B)M(C)             | 4.91 .00 | M(B)M(C)             | .42 .11 | M(B)M(C)             | .237 .03 |

e. Procedure in this Experiment.

It is important to note that by initial control in selection of subjects, and in arranging these subjects in groups, three groups were obtained which, for experimental purposes, may be considered identical in the factors which were controlled. If only the mean scores are used in making comparisons of the behavior of the three groups under different instruction or with different atti-



tudes of work, it is possible to determine whether these differences are significant. The standard errors of the differences of means have such a relation to the differences as not to be considered significant in the cases of intelligence and chronological age. Therefore these two factors do not need to be taken into account in interpreting other differences (refer to standard errors of differences, p. 48 (64)).

Using Material I, Group A was taught Material I with Method I (previously outlined, p. 45). The instruction for Method I was given to the subject. Set I of Material I was then presented. The order is shown in figure 8. Each card was exposed five seconds. At approximately the middle of the interval the nonsense name was pronounced by the experimenter. The name was read from the back of the card being shown. The timing was done with a stop watch. On the type of record sheet described (p. 41), in view of the subject, a plus mark was put for a correct response and a minus for an incorrect or omitted response. Twenty seconds were allowed between presentations and a five-minute interval at the end of every fifteen minutes of work.

Using the same Material, Group B was taught this material in the same manner except for the variation in instruction described as Method II (p. 41). In like manner Group C was taught Material I with Method III (p. 41).

With Groups A and B, Methods I and II, the series was considered learned when every member could be correctly named twice in succession. The material was considered learned when the score on the first two trials of a new series was perfect. In the case of Group C with Method III the number of presentations and manner of presenting has been described (pp. 41, 42, 45).

Sets XV, XVI, XVII, and XVIII were used to check on the retention and functioning of the generalization at a later time. The interval between learning and recall was one week in the case of the children. A perfect score would be 32, since there are eight members in each of these four series. Although the generalization is the same, the actual pictures and names of these four sets are new to the subject.

The nonsense syllable Series I was then taught to the same

three groups of subjects. Using the booklet described (p. 38), each successive syllable was exposed for five seconds. At the end of the presentation of the series the subject reproduced orally as much as he remembered of the series. A record was made of his responses on the record sheet (p. 42), not in sight of the subject. This was a record of the actual syllables reproduced and the order of their reproduction. This memory record proved valuable in interpreting the generalization record and also in checking on the equating of the three groups in the memory factor.

The results were scored and treated in the manner described previously (pp. 42, 43). This included a score on successive trials for individuals and for groups, also a score for each position in the case of individuals and groups. This latter score was changed to a percentage score. In this way comparisons could be made where the number of trials varied. The mean deviation from the percentage value was also computed and used as a measure of generalization (refer to discussion of scoring, p. 43).

f. Results of Experiment I, with Children.

(1) Number learning with variation of intellectual generalization attitude.

These results have to do with the learning of Material I (p. 31) with variations in instruction described as Methods I, II, and III (p. 41).

Not all of the subjects generalized with Method I. With Methods II and III, generalization, *i.e.*, learning, occurred in every case. Table III gives a summary of the number and per cent. of subjects generalizing with the different instructions.

TABLE III  
Number and Per Cent. of Subjects Learning Material I  
with Different Instructions.

|                         | Method I | Method II | Method III |
|-------------------------|----------|-----------|------------|
| Per cent. learning..... | 69.2     | 100       | 100        |
| Number learning .....   | 9 of 13  | 13 of 13  | 13 of 13   |

Table IV shows the details with reference to the three groups working with different instructions:



TABLE IV

*Group A. Learning Material I, Method I*

| Case Number             | Learning Trials Taken | Series Learned | Recall after 1 week<br>Score on Recall<br>(32 = 100%) |                    |
|-------------------------|-----------------------|----------------|---|--------------------|
| 28.....                 | 75—                   | 1              | 0   |                    |
| 1.....                  | 31                    | 2              | 31  |                    |
| 29.....                 | 13                    | 1              | 21  | — after a num-     |
| 2.....                  | 75                    | 2              | 31  | ber means that     |
| 3.....                  | 75—                   | 9              | 0   | the generalization |
| 4.....                  | 14                    | 1              | 31  | did not occur in   |
| 30.....                 | 75—                   | 2              | 0   | 75 trials.         |
| 5.....                  | 16                    | 1              | 32  | Inc.—Not able      |
| 6.....                  | 64                    | 2              | 32  | to get subject for |
| 7.....                  | 48                    | 2              | Inc   | Recall score.      |
| 8.....                  | 75—                   | 3              | 0   |                    |
| 9.....                  | 6                     | 1              | 23  |                    |
| 31.....                 | 9                     | 1              | 32  |                    |
| Means (I.Q. 107) M (4—) | 75—                   | 2.1            | M (4—)  | 0                  |
| (I.Q. 114) M (9 )       | 20.6                  |                | M (9 )  | 29.1               |

*Group B. Learning Material I, Method II*

|            |      |      |      |
|------------|------|------|------|
| 10.....    | 8    | 1    | 31   |
| 32.....    | 10   | 2    | 22   |
| 11.....    | 41   | 3    | 25   |
| 12.....    | 32   | 1    | 30   |
| 33.....    | 7    | 2    | 23   |
| 13.....    | 15   | 1    | Inc  |
| 14.....    | 36   | 2    | 29   |
| 34.....    | 6    | 1    | 16   |
| 15.....    | 8    | 1    | Inc  |
| 16.....    | 9    | 2    | 15   |
| 35.....    | 12   | 1    | Inc  |
| 17.....    | 6    | 1    | 22   |
| 18.....    | 4    | 1    | 30   |
| Means..... | 14.9 | 1.46 | 24.3 |

*Group C. Learning Material I, Method III*

|            |    |   |      |
|------------|----|---|------|
| 36.....    | 30 | 3 | 7    |
| 19.....    | 30 | 3 | 31   |
| 37.....    | 30 | 3 | 23   |
| 20.....    | 30 | 3 | 8    |
| 21.....    | 30 | 3 | 32   |
| 22.....    | 30 | 3 | 13   |
| 23.....    | 30 | 3 | 21   |
| 24.....    | 30 | 3 | Inc  |
| 38.....    | 30 | 3 | 13   |
| 25.....    | 30 | 3 | 22   |
| 26.....    | 30 | 3 | 17   |
| 27.....    | 30 | 3 | 9    |
| 39.....    | 30 | 3 | 32   |
| Means..... | 30 | 3 | 19.0 |

30 trials was the number decided upon arbitrarily for this method.

TABLE V  
Summary of Groups A, B, and C  
(Means given in every case)

| Method | Group           | I.Q.  | M.A. | C.A. | Material I<br>Learning<br>Trials<br>(*) | Series | Recall<br>Score<br>(†)          |
|--------|-----------------|-------|------|------|---|--------|---------------------------------|
| I      | A<br>(13 cases) | 112.3 | 10.1 | 9.1  | 44.3 (13)<br>75— (4)<br>30.6 (9)        | 2.1    | 10.4 (12)<br>0— (4)<br>29.1 (8) |
| II     | B<br>(13 cases) | 112.4 | 10.2 | 9.1  | 14.9                                    | 1.45   | 24.3                            |
| III    | C<br>(13 cases) | 112.4 | 10.1 | 9.1  | 30                                      | 3      | 19.0                            |

Table V shows that all do not learn with Method I, that those who learn take longer than with Methods II and III, but that if those not learning are eliminated, the result is retained better and is recalled more completely with Method I than with Methods II or III. A further discussion and treatment of the relative efficiency of the concepts of those learning will be given later in this report.

(2) Relation of Intellectual Status to chance of learning with Method I and Method II.

Any type of statistical treatment shows a decided relation between intellectual status and chance of learning with either instruction. The group working with Method I included 13 cases whose mean I.Q. was 112.3. Of these 13 cases, 9 learned in the time given and 4 did not learn. The limit set in this case was 75 trials, with the intervals described (p. 40). Table VI

TABLE VI  
I.Q. and Chance of Learning with Method I

|                         | No. of Cases | I.Q. (Mean of Cases) | Range         |
|-------------------------|--------------|----------------------|---------------|
| Total group .....       | 13 cases     | 112.3                | 86.6 to 145   |
| Group learning .....    | 9 cases      | 114.5                | 87.0 to 145   |
| Group not learning..... | 4 cases      | 107.5                | 86.6 to 125.7 |

\* The first trial score is the mean of the total group; the second trial score is for four subjects who did not learn in 75 trials, and the third is mean of scores of the nine subjects learning.

† Differential report: Total group, those not learning, those learning. Minus in every case indicates the subject who did not learn in trials shown.



shows the relation of the mean I.Q.'s of those learning and those not learning by this method.

Using the Bi-Serial method of correlation,<sup>1</sup> the correlation between learning and not learning, on one side, and intellectual status as measured by the I.Q. rating, on the other side, was 0.25. Since the frequency here is only 13 cases, the probable error of this coefficient would be too large<sup>2</sup> to consider the coefficient significant of its own accord. Nevertheless, taking the coefficient together with other indications given in other statistical facts, it is safe to say that some positive correlation is indicated between the two factors.

Another approach to the relation of intellectual status to generalization with Method I and Method II is to consider the number of trials taken to generalize in the cases of those subjects who did generalize in the time given. Using the product moment coefficient of correlation.<sup>3</sup> Table VII gives the results of this consideration:

TABLE VII

Correlation between I.Q. and Speed of Generalizing

|                                   |                             |
|-----------------------------------|-----------------------------|
| Material I, Method I, $r = +.35$  | Standard error of $r = .31$ |
| Material I, Method II, $r = +.91$ | Standard error of $r = .04$ |

Here again the number of cases is small (8 in first case and 13 in second); therefore the standard error is large. Nevertheless there is indicated a high degree of relationship between intelligence and ability to generalize with the variations of attitude shown. The correlation is much higher in the case of Method II, where the definite problem set is to discover the generalization. Probably this is to be expected from the likeness of this problem situation to the problems in the test series from which the I.Q. was derived.

Using a rank order method of deriving the correlations,<sup>4, 5</sup> which would ignore the large differences in time taken, and including here only those who finally learned, the correlations shown in

<sup>1</sup> Bi-Serial R, Kelley, T. L. *Statistical Methods*, p. 247.

<sup>2</sup> Standard error = .34

<sup>3</sup> Kelley, T. L. *Statistical Method*, p. 161.

<sup>4</sup> Davenport. *Statistical Methods*, p. 116.

<sup>5</sup> Kelley, T. L. *Statistical Method*, p. 191.

Table VIII were found to exist between intellectual status as given by the I.Q. and rank order of generalizing.

TABLE VIII  
Correlation between I.Q. and Speed of Generalizing (Rank Order)  
Material I, Method I,  $r = .762$       Standard error of  $r = .14$   
Material I, Method II,  $r = .477$       Standard error of  $r = .21$

This seems to the writer to be more nearly the true correlation in the case of Method I because it does not give undue importance to those subjects who because of some wrong lead remained off the track a very long time. In the same way the correlation given by the product moment method seems to the writer to express more nearly the fact in the case of Method II, for here slight differences in time would be significant since the subject is seeking a generalization. Both methods of correlation express the relationship more clearly and completely than does either one alone.

The above facts show that within the limits of the given attitude intelligence is a large factor in determining score or speed of performance. This does not mean that difference of results in the case of different groups with different attitudes of work due to difference of instruction is to be explained in terms of difference of intelligence, because in every case the groups compared are equated in intelligence. The range is wide enough in every group to afford information with reference to the functioning of intelligence within the limits of the attitude in question. For that reason this treatment is included as of interest and importance in interpreting the results.

(3) Relative efficiency of Methods I, II, and III when learning occurred.

Those subjects in Group A who succeeded in learning by Method I were equated, mentally, etc., with subjects chosen from Groups B and C who worked with Methods II and III, respectively. The method of equating groups was to select the subjects from Group A learning, and to pair these with subjects from Groups B and C on basis of intelligence. This treatment resulted in three groups of 8 subjects each. The details of this group and of their performance are given in Table IX. Using the



TABLE IX

(This table is a rearrangement of Table IV, based on a selection of those learning with Method I equated with equal numbers from Groups B and C.)

Comparison of Those Learning with Methods I, II, and III

Group A—Method I—Material I (All Subjects Learned)

| Case No.                         | I.Q.  | Learning |        | Recall after 1 week<br>Score (32 is perfect) |
|----------------------------------|-------|----------|--------|--|
|                                  |       | Trials   | Series |  |
| 1.....                           | 87    | 31       | 2      | 31   |
| 29.....                          | 99.2  | 13       | 1      | 21   |
| 2.....                           | 105.6 | 75       | 2      | 31   |
| 4.....                           | 106.5 | 14       | 1      | 31   |
| 5.....                           | 115.5 | 16       | 1      | 32   |
| 6.....                           | 116.0 | 64       | 2      | 32   |
| 9.....                           | 138.0 | 6        | 1      | 23   |
| 31.....                          | 145.7 | 9        | 1      | 32   |
| Means .....                      | 113.9 | 28.5     | 1.37   | 29.1   |
| Stand. errors.....               | 18.3  | 27.4     |        | 4.1  |
| Stand. errors.....<br>(of Means) | 6.4   | 9.7      |        | 1.4  |

Group B—Method II

|                     |       |      |     |      |
|---------------------|-------|------|-----|------|
| 32.....             | 98.4  | 10   | 2   | 22   |
| 11.....             | 102.0 | 41   | 3   | 25   |
| 12.....             | 104.8 | 32   | 1   | 30   |
| 14.....             | 108.4 | 36   | 2   | 29   |
| 34.....             | 116.5 | 6    | 1   | 16   |
| 16.....             | 121.5 | 9    | 2   | 15   |
| 17.....             | 125.6 | 6    | 1   | 22   |
| 18.....             | 134.9 | 4    | 1   | 30   |
| Means .....         | 114.0 | 18.0 | 1.6 | 23.6 |
| Stand. errors ..... | 13.5  | 14.5 |     | 5.5  |
| Stand. errors ..... | 4.7   | 3.7  |     | 1.9  |
| (of Means)          |       |      |     |      |

Group C—Method III

|                     |       |    |   |      |
|---------------------|-------|----|---|------|
| 19.....             | 96.0  | 30 | 3 | 31   |
| 37.....             | 100.0 | 30 | 3 | 23   |
| 21.....             | 104.2 | 30 | 3 | 32   |
| 22.....             | 107.2 | 30 | 3 | 13   |
| 38.....             | 118.3 | 30 | 3 | 13   |
| 26.....             | 126.4 | 30 | 3 | 17   |
| 27.....             | 127.0 | 30 | 3 | 9    |
| 39.....             | 137.7 | 30 | 3 | 32   |
| Means.....          | 114.6 | 30 | 3 | 21.2 |
| Stand. errors ..... | 13.9  | 0  |   | 8.8  |
| Stand. errors ..... | 4.9   | 0  |   | 3.1  |
| (of Means)          |       |    |   |      |

Standard Errors of Differences of Means and Differences

| Mean     | Intelligence |            | Learning |            | Recall |            |
|----------|--------------|------------|----------|------------|--------|------------|
|          | Error        | Difference | Error    | Difference | Error  | Difference |
| M(A)M(B) | 7.9          | .10        | 10.3     | 10.5       | 2.3    | 5.5*       |
| M(A)M(C) | 8.0          | .70        |          |            | 3.4    | 7.9*       |
| M(B)M(C) | 6.7          | .6         |          |            | 3.6    | 2.4*       |

\* These are the only differences that seem at all significant.

statistical methods indicated, and discussing the number of trials taken to learn (this is to be considered as a time unit), no necessary significance is indicated between differences of time taken to learn with Methods I and II. Nevertheless the differences in scores on the recall process one week later indicate that the material learned or the generalization arrived at does not have the same value. Method I is superior to both Methods II and III. There is some preference favoring Method II over Method III, but, considering the standard error of the difference, it is not great enough to be taken as necessarily significant. The standard errors of these differences and the actual differences are given at the end of the table.

(4) Qualitative differences in the process of learning.

(a) Method I analyzed to discover differences between the process in the case of those finally learning and those not learning: In Set I of Material I, presented to the children and also to the adult group, the fifth member of the series was the opposite of the fourth member. This was changed to the order shown (p. 31) for the Whittier group. This irregularity in the material as given to the children afforded results of an interesting type with reference to the process going on in the case of those of Group A, who did not learn in comparison with the process in the cases of those who finally learned. Fig. 13 shows that the part of the group that finally learned by Method I was taking advantage of the association offered by the relation of members 4 and 5 of the first series. It also shows that those who did not learn were not aware of this relationship. Table X indicates the same fact.

The two groups, besides showing differences in the development of associations, showed also a difference from the beginning of the process in scores on trials. If a group comparison is made, those who finally learned were from the beginning ahead of those who did not learn. This difference shows that indications of generalization are present from the beginning. Continuing with the process or adding further experiences does not seem to be the chief factor in bringing about a generalization. The problem



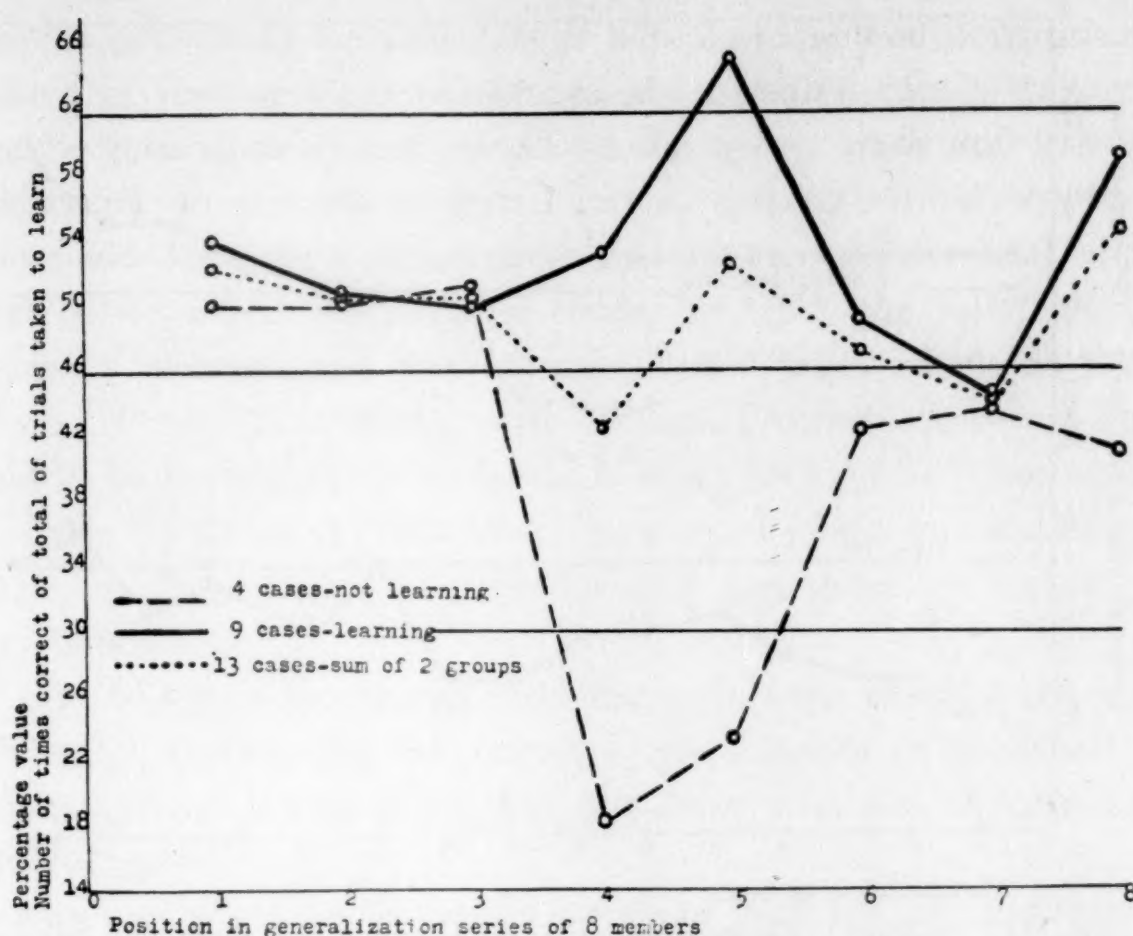


FIG. 13. Children: Comparison of those learning and those not learning with Method I. Position preference in a series.

that the subject has set for himself seems to be the determining factor. Another fact of interest seems to be that if a subject arrives at an incorrect or imperfect generalization which is evidently inadequate, it seems difficult for him to discard this generalization. There would therefore be indicated, by the analysis of the results with Method I, three possible differences in the

TABLE X

Showing the per cent of times different members of the series were correct in learning Material I with Method I.

| Position in Series | Cases Learning (9)<br>Per cent of Times Correct | Cases Not Learning (4)<br>Per cent of Times Correct | Total (13)<br>Per cent Correct |
|--------------------|---|---|--------------------------------|
| 1.....             | 54.03   | 50.05   | 52.8                           |
| 2.....             | 51.4  | 50.27   | 51.0                           |
| 3.....             | 50.1  | 51.72   | 50.5                           |
| 4.....             | 53.6  | 18.22   | 42.7                           |
| 5.....             | 65.6  | 23.62   | 52.7                           |
| 6.....             | 49.3  | 42.35   | 47.4                           |
| 7.....             | 44.82   | 43.97   | 44.5                           |
| 8.....             | 59.78   | 41.00   | 54.7                           |

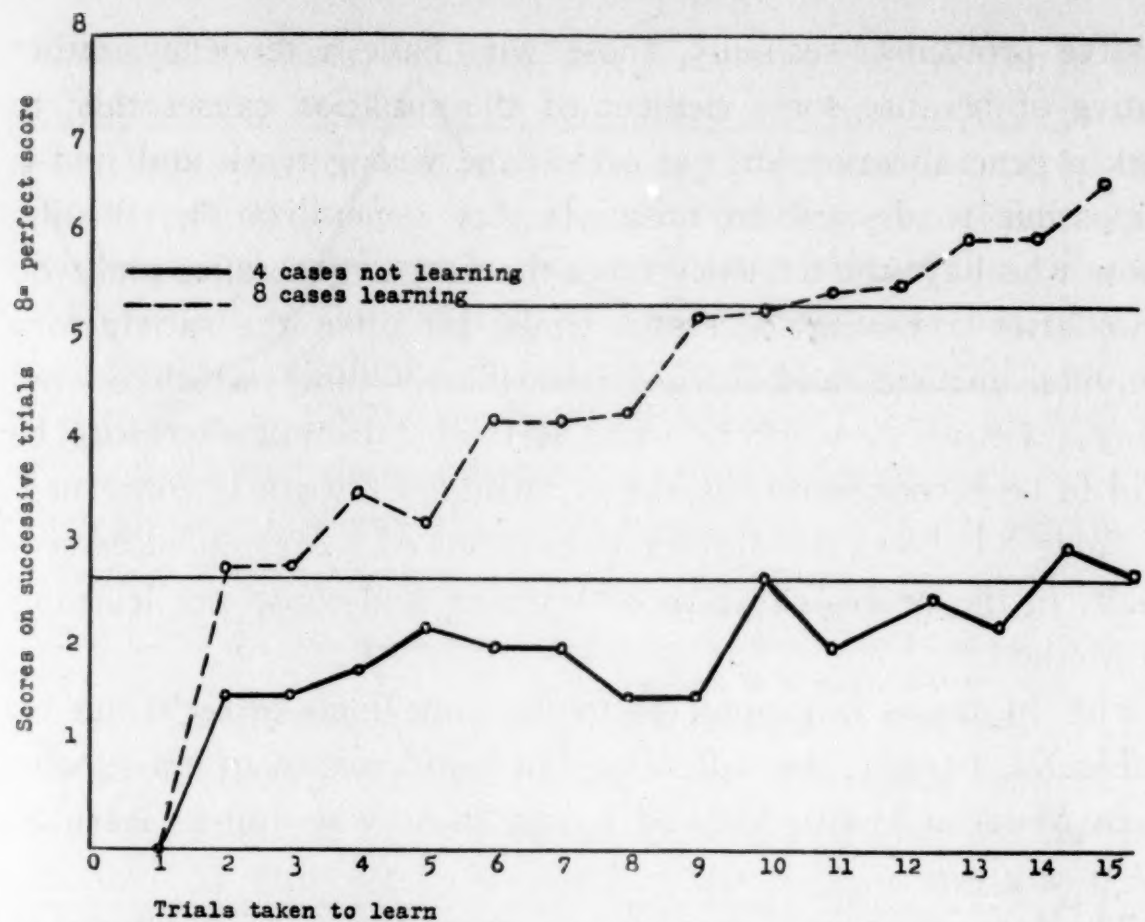


FIG. 14. Children: Comparison of those learning and those not learning with Method I. Scores on successive trials.

processes of the individuals working with this instruction: First, those who accept the problem as a series of memory exercises and indicate only such change or improvement from set to set of the material as is to be expected from similarity of names in the suc-

TABLE XI  
Scores on successive trials of 8 cases learning and 4 cases not learning  
Material I with Method I.

| Trials  | 8 Cases Learning<br>Mean Scores | 4 Cases Not Learning<br>Mean Scores |
|---------|---------------------------------|-------------------------------------|
| 1.....  | 0                               | 0                                   |
| 2.....  | 2.7                             | 1.5                                 |
| 3.....  | 2.7                             | 1.5                                 |
| 4.....  | 3.5                             | 1.7                                 |
| 5.....  | 3.2                             | 2.2                                 |
| 6.....  | 4.2                             | 2.0                                 |
| 7.....  | 4.2                             | 2.0                                 |
| 8.....  | 4.3                             | 1.5                                 |
| 9.....  | 5.2                             | 1.5                                 |
| 10..... | 5.3                             | 2.7                                 |
| 11..... | 5.5                             | 2.0                                 |
| 12..... | 5.6                             | 2.5                                 |
| 13..... | 6.1                             | 2.2                                 |
| 14..... | 6.1                             | 3.0                                 |
| 15..... | 6.6                             | 2.7                                 |



The four cases whose results are given in Table XII illustrate three differences of attitude assumed by individuals given the same instruction. These cases were learning Material I with Method I instruction.

(1) Illustration of first type, accepting the series of problems as a set of memory exercises.

| S.—Set. |     |     | Tr.—Trial. |     |     | Sc.—Score. |       |     |
|---------|-----|-----|------------|-----|-----|------------|-------|-----|
| S.      | Tr. | Sc. | S.         | Tr. | Sc. | S.         | Tr.   | Sc. |
| I       | 1   | 0   | 16         | 3   | 31  | 4          | 46    | 6   |
|         | 2   | 1   | 17         | 3   | 32  | 5          | 47    | 8   |
|         | 3   | 0   | 18         | 1   | 33  | 4          | 48    | 5   |
|         | 4   | 1   | 19         | 1   | 34  | 0          | 49    | 7   |
|         | 5   | 2   | 20         | 4   | 35  | 1          | 50    | 5   |
|         | 6   | 1   | 21         | 4   | 36  | 3          | 51    | 4   |
|         | 7   | 2   | 22         | 2   | 37  | 2          | 52    | 5   |
|         | 8   | 1   | 23         | 3   | 38  | 4          | 53    | 7   |
|         | 9   | 2   | 24         | 1   | 39  | 4          | 54    | 7   |
|         | 10  | 4   | 25         | 2   | 40  | 3          | 55    | 8   |
|         | 11  | 2   | 26         | 4   | 41  | 2          | 56    | 8   |
|         | 12  | 1   | 27         | 2   | 42  | 1          | II 57 | 0   |
|         | 13  | 2   | 28         | 3   | 43  | 4          | 58    | 2   |
|         | 14  | 3   | 29         | 3   | 44  | 5          | 59    | 2   |
|         | 15  | 4   | 30         | 2   | 45  | 4          | 60    | 1   |

- (2) Illustration of second type, tending to seek a generalization but getting off on the wrong track, and having tried an incorrect generalization, having this finally become fixed and stand in the way of further trials.

## Case 3—Group A—Material I—Method I

| S. | Tr. | Sc. | S. | Tr. | Sc. | S.  | Tr. | Sc. | S. | Tr. | Sc. | S.   | Tr.  | Sc. |
|----|-----|-----|----|-----|-----|-----|-----|-----|----|-----|-----|------|------|-----|
| I  | 1   | 1   |    | 24  | 4   |     | 47  | 4   |    | 70  | 3   |      | 93   | 8   |
|    | 2   | 0   |    | 25  | 4   |     | 48  | 5   |    | 71  | 6   | VII  | 94   | 4   |
|    | 3   | 2   |    | 26  | 4   |     | 49  | 4   |    | 72  | 6   |      | 95   | 4   |
|    | 4   | 1   |    | 27  | 6   |     | 50  | 6   |    | 73  | 8   |      | 96   | 7   |
|    | 5   | 2   |    | 28  | 6   |     | 51  | 6   |    | 74  | 8   |      | 97   | 8   |
|    | 6   | 1   |    | 29  | 7   |     | 52  | 6   | IV | 75  | 3   |      | 98   | 8   |
|    | 7   | 1   |    | 30  | 7   |     | 53  | 6   |    | 76  | 4   | VIII | 99   | 0   |
|    | 8   | 0   |    | 31  | 8   |     | 54  | 6   |    | 77  | 3   |      | 100  | 7   |
|    | 9   | 1   |    | 32  | 8   |     | 55  | 6   |    | 78  | 4   |      | 101  | 7   |
|    | 10  | 2   | II | 33  | 0   |     | 56  | 7   |    | 79  | 7   |      | 102  | 8   |
|    | 11  | 1   |    | 34  | 3   |     | 57  | 7   |    | 80  | 8   |      | 103  | 8   |
|    | 12  | 2   |    | 35  | 0   |     | 58  | 8   |    | 81  | 8   | IX   | 104  | 0   |
|    | 13  | 2   |    | 36  | 2   |     | 59  | 8   | V  | 82  | 4   |      | 105  | 5   |
|    | 14  | 3   |    | 37  | 1   | III | 60  | 3   |    | 83  | 4   |      | 106  | 7   |
|    | 15  | 2   |    | 38  | 3   |     | 61  | 0   |    | 84  | 6   |      | 107  | 8   |
|    | 16  | 4   |    | 39  | 2   |     | 62  | 2   |    | 85  | 7   |      | 108  | 8   |
|    | 17  | 3   |    | 40  | 1   |     | 63  | 3   | VI | 86  | 3   | X    | 109  | 4   |
|    | 18  | 2   |    | 41  | 3   |     | 64  | 2   |    | 87  | 1   |      | 110  | 5   |
|    | 19  | 2   |    | 42  | 4   |     | 65  | 2   |    | 88  | 5   |      | 111  | 7   |
|    | 20  | 3   |    | 43  | 4   |     | 66  | 1   |    | 89  | 6   |      | 112  | 8   |
|    | 21  | 3   |    | 44  | 2   |     | 67  | 2   |    | 90  | 8   |      | 113  | 8   |
|    | 22  | 5   |    | 45  | 3   |     | 68  | 2   |    | 91  | 8   |      | etc. |     |
|    | 23  | 3   |    | 46  | 3   |     | 69  | 3   |    | 92  | 4   |      |      |     |

- (3) Illustration of third type, seeking to generalize in spite of having no instruction to that effect and discarding without difficulty the inadequate generalization.

## Material I—Method I

## Case 5

| S. | Tr. | Sc. | S. | Tr. | Sc. | S. | Tr. | Sc. | S. | Tr. | Sc. | S.  | Tr. | Sc. |
|----|-----|-----|----|-----|-----|----|-----|-----|----|-----|-----|-----|-----|-----|
| I  | 1   | 0   |    | 12  | 6   | I  | 1   | 0   |    | 12  | 3   | II  | 23  | 3   |
|    | 2   | 1   |    | 13  | 7   |    | 2   | 4   |    | 13  | 4   |     | 24  | 8   |
|    | 3   | 0   |    | 14  | 8   |    | 3   | 5   |    | 14  | 3   |     | 25  | 3   |
|    | 4   | 0   |    | 15  | 8   |    | 4   | 5   |    | 15  | 6   |     | 26  | 5   |
|    | 5   | 0   | II | 16  | 8   |    | 5   | 5   |    | 16  | 3   |     | 27  | 5   |
|    | 6   | 3   |    | 17  | 8   |    | 6   | 4   |    | 17  | 4   |     | 28  | 6   |
|    | 7   | 2   |    |     |     |    | 7   | 4   |    | 18  | 4   |     | 29  | 8   |
|    | 8   | 3   |    |     |     |    | 8   | 3   |    | 19  | 6   |     | 30  | 8   |
|    | 9   | 6   |    |     |     |    | 9   | 6   |    | 20  | 5   | III | 31  | 8   |
|    | 10  | 5   |    |     |     |    | 10  | 3   |    | 21  | 8   |     | 32  | 8   |
|    | 11  | 3   |    |     |     |    | 11  | 5   |    | 22  | 8   |     |     |     |

(b) Differences evidenced by other types of statistical treatment: The idea that the writer had in mind here was to attempt to compare, in some objective way, the difference in behavior when generalization was occurring and when it was not occurring. In order to have material for comparison as well as to equate the groups used in memory experiments, the subjects



had been taught a series of nonsense syllables of the same length as the individual sets of the generalization material. Two types of treatment were then given to this material: First, a comparison was made of the regularity of progress in the case of the different attitudes and in the case of the memory process; secondly, a comparison was made with the different attitudes present with generalizing and with the memory process, using the percentage values of the different positions in the series (per cent. of times a given member was correct of total of trials taken to learn, discussion pp. 42, 43). In addition, a comparison was made of the mean deviation of these percentage values in each case.

Fig. 15 (p. 61) shows the difference in type of learning curve in the following three cases: First, learning a series of purely nonsense syllables; secondly, learning Material I with Method I; thirdly, learning Material I with Method II. The purely memory process shows greater regularity in its progress upward than the curve for Method I or Method II. Method I curve approximates the memory curve more nearly than does Method II curve. This

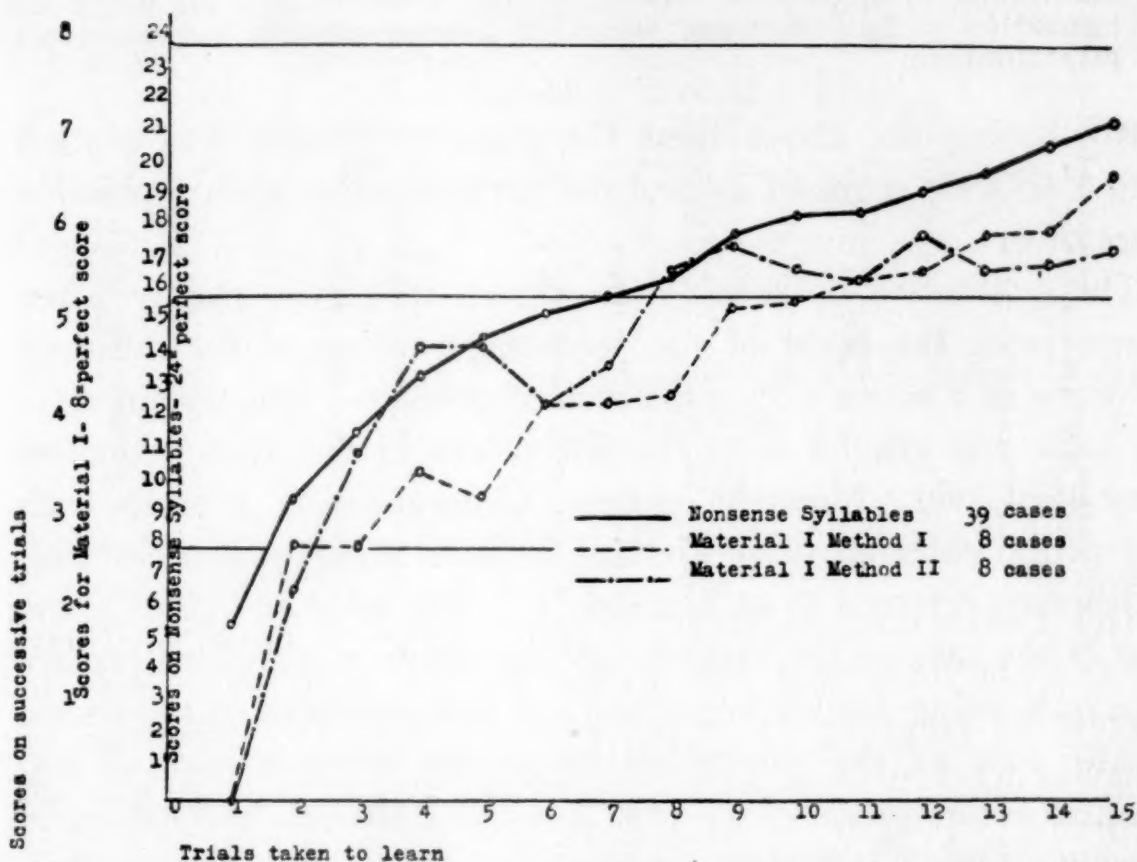


FIG. 15. Children: Comparison of learning curves with different attitudes. Scores on successive trials.

approximation agrees with other comparisons given later. All subjects used here had learned and the groups were of equal mentality. Table XIII gives the data presented in Fig. 15.

TABLE XIII

Comparison of Learning in the Case of Memory and Generalization.  
The third Generalization attitude (Method III) did not allow for this type of treatment.

| Trials  | Score  | Score  | Score   |
|---------|--|--|---|
|         | Learning Nonsense<br>Syllables<br>(39 cases) | Learning Material I<br>Method I<br>(8 cases) | Learning Material I<br>Method II<br>(8 cases) |
| 1.....  | 5.7  | 0  | 0   |
| 2.....  | 9.6  | 2.7  | 2.2   |
| 3.....  | 11.7   | 2.7  | 3.7   |
| 4.....  | 13.5   | 3.5  | 4.8   |
| 5.....  | 14.8   | 3.2  | 4.8   |
| 6.....  | 15.5   | 4.2  | 4.2   |
| 7.....  | 16.0   | 4.2  | 4.6   |
| 8.....  | 16.6   | 4.3  | 5.6   |
| 9.....  | 18.0   | 5.2  | 5.8   |
| 10..... | 18.6   | 5.3  | 5.6   |
| 11..... | 18.7   | 5.5  | 5.5   |
| 12..... | 19.3   | 5.6  | 6.0   |
| 13..... | 20.0   | 6.1  | 5.6   |
| 14..... | 20.9   | 6.1  | 5.7   |
| 15..... | 21.5   | 6.6  | 5.8   |

In plotting the above facts the memory process was plotted with a possible score of 24 and the generalization with a possible score of 8.

The qualitative differences are shown still more clearly when comparisons are made of the percentage values of the different positions in a series with difference of process. The accompanying table and graphs show the differences in the three processes mentioned, viz., Memory process, Generalization process with instruction referred to as Method I, Generalization process with instruction referred to as Method II. The table and chart show that in the case of the memory process there is a decided preference in learning for the beginning and end members of the series. In the case of the generalization process with Method I and Method II the value of the first and last members, in relation to other positions in the series, is less than with the memory process. The more generalization is present in the process the more nearly



the line made by joining these points approaches a straight line. Another interesting fact is that with Method I, as with the memory process, but in a lesser degree, the first member has a preference over the second and third; while with Method II the second member of the series has a preference over the first. The reason for this is possibly because with Method II the idea in mind is to seek a generalization. With this idea in mind the first member in a series could not have value in itself because of its position. Before any attempt could be made to generalize, at least two members must have been experienced. This gives the preference to the second member with Method II and shows also that with Method I the process is more nearly like the memory process. The facts are brought out in Table XIV and Figs. 16 and 17.

TABLE XIV

Showing Percentage Values of Different Positions in a Series with Different Processes of Learning.

| Position | Learning Nonsense<br>Syllables<br>(39 cases)<br>Percentage of<br>Times Correct | Learning Material I<br>Method I<br>(13 cases, 9 learning,<br>4 not learning)<br>Percentage of<br>Times Correct | Learning Material I<br>Method II<br>(13 cases,<br>all learning)<br>Percentage of<br>Times Correct |
|----------|--|--|---|
|          |  |  |   |
| 1.....   | 89.8   | 52.8   | 56.6  |
| 2.....   | 63.9   | 51.0   | 63.4  |
| 3.....   | 49.3   | 50.5   | 58.8  |
| 4.....   | 61.4   | 42.7   | 51.5  |
| 5.....   | 51.0   | 52.7   | 59.9  |
| 6.....   | 48.5   | 47.4   | 59.5  |
| 7.....   | 71.2   | 44.5   | 59.1  |
| 8.....   | 72.9   | 54.7   | 59.1  |

|        | Method I—8 cases<br>Learning | Method II—8 cases<br>Learning |
|--------|------------------------------|-------------------------------|
| 1..... | 53.7                         | 60.1                          |
| 2..... | 52.8                         | 62.7                          |
| 3..... | 53.2                         | 57.3                          |
| 4..... | 55.6                         | 47.9                          |
| 5..... | 69.4                         | 57.2                          |
| 6..... | 51.0                         | 57.5                          |
| 7..... | 46.0                         | 54.1                          |
| 8..... | 62.5                         | 59.9                          |

By summing the percentage values of the different members in the series and finding the mean deviation from the mean percentage values with the different processes, the following facts are brought out: In the case of the memory process the mean

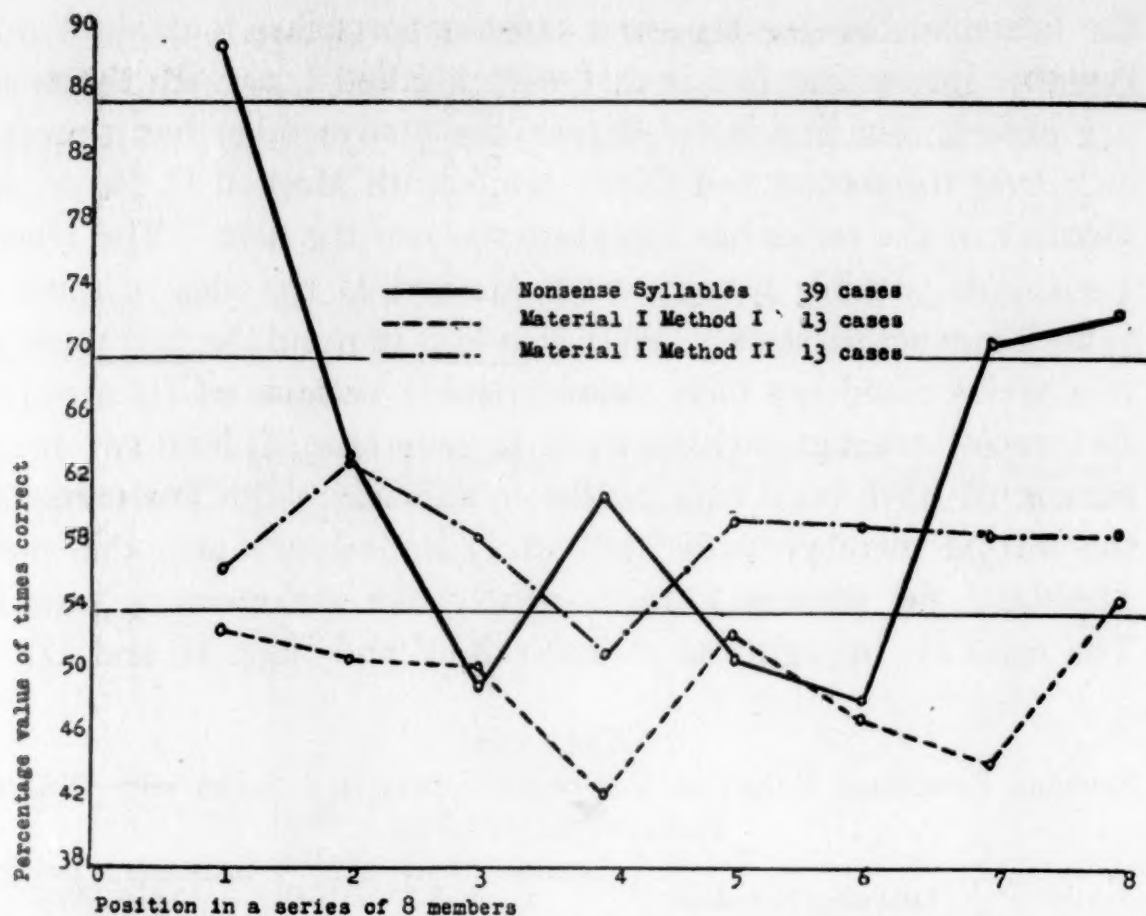


FIG. 16. Children: Comparison of processes with different attitudes. Percentage values of position in series.

deviation of the percentage values of the different positions in the series is much larger than in the process where generalization is possible: Of the two variations in attitude, referred to as Methods I and II, the former has a larger percentage value than Method II. This means that the process with Method I resembles more nearly the process of memory than does the process with Method II.

TABLE XV

Percentage Values of Positions in a Series and their Mean Deviations.  
Learning Nonsense Syllables—39 cases

| Position | Percentage Value | Deviations     |
|----------|------------------|----------------|
| 1.....   | 89.8             | 26.3           |
| 2.....   | 63.9             | .4             |
| 3.....   | 49.3             | 14.2           |
| 4.....   | 61.4             | 2.1            |
| 5.....   | 51.0             | 12.5           |
| 6.....   | 48.5             | 15.0           |
| 7.....   | 71.2             | 7.7            |
| 8.....   | 72.9             | 9.4            |
| Mean     | 63.5             | Mean Dev. 10.2 |



| Learning Material I—Method I (13 cases) |                  |               |
|---|------------------|---------------|
| Position                                | Percentage Value | Deviations    |
| 1.....                                  | 52.8             | 3.3           |
| 2.....                                  | 51.0             | 1.5           |
| 3.....                                  | 50.5             | 1.0           |
| 4.....                                  | 42.7             | 6.8           |
| 5.....                                  | 52.7             | 3.2           |
| 6.....                                  | 47.4             | 2.1           |
| 7.....                                  | 44.5             | 5.0           |
| 8.....                                  | 54.7             | 5.2           |
|   | Mean 49.5        | Mean Dev. 3.5 |

| Learning Material I—Method II (13 cases) |                  |               |
|--|------------------|---------------|
| Position                                 | Percentage Value | Deviations    |
| 1.....                                   | 56.6             | 1.8           |
| 2.....                                   | 63.4             | 5.0           |
| 3.....                                   | 58.8             | .4            |
| 4.....                                   | 51.5             | 6.9           |
| 5.....                                   | 59.9             | 1.5           |
| 6.....                                   | 59.5             | 1.1           |
| 7.....                                   | 59.1             | .7            |
| 8.....                                   | 59.1             | .7            |
|  | Mean 58.4        | Mean Dev. 2.2 |

Table XV shows this difference. This is simply a mathematical statement of the facts presented in graphic form in Figs. 16 and 17.

Summary: In the above three cases the mean deviations are as follows:

|                      |      |
|----------------------|------|
| Memory process ..... | 10.2 |
| Method I .....       | 3.5  |
| Method II .....      | 2.2  |

If instead of the total group of 13 learning Material I with Method I, only the 8 learning are equated with 8 in Group II, the following is the result:

|                 |      |
|-----------------|------|
| Memory. ....    | 10.2 |
| Method I .....  | 5.2  |
| Method II ..... | 3.0  |

(c) Information from individual learning curves of children: Illustrations were given previously on successive trials in the case of four children who learned and who had the attitude resulting from the instruction called Method I (pp. 41, 45). The scores

showed that in these cases there was not a like approach. They indicated three different attitudes or problems that the subject had set for himself in the absence of definite instructions. Fig. 18 presents a comparison of the processes of two children working with instruction I (Method I, p. 41). One of these subjects generalized on the seventy-fifth trial. The second did not arrive at an adequate generalization even though the process was continued to 113 trials and 10 sets of the same kind of materials were learned. At the end the subject seemed to have arrived at some method which did not vary and which allowed him to learn in an average of 5 trials that which had previously taken as many as 32 trials.

It is interesting to note here the following facts: First, the subjects were about equal in memory as measured by their learning of purely nonsense material; secondly, the subject who finally learned on the seventy-fifth trial was inferior to the subject who did not learn even with a greater number of trials if measured in

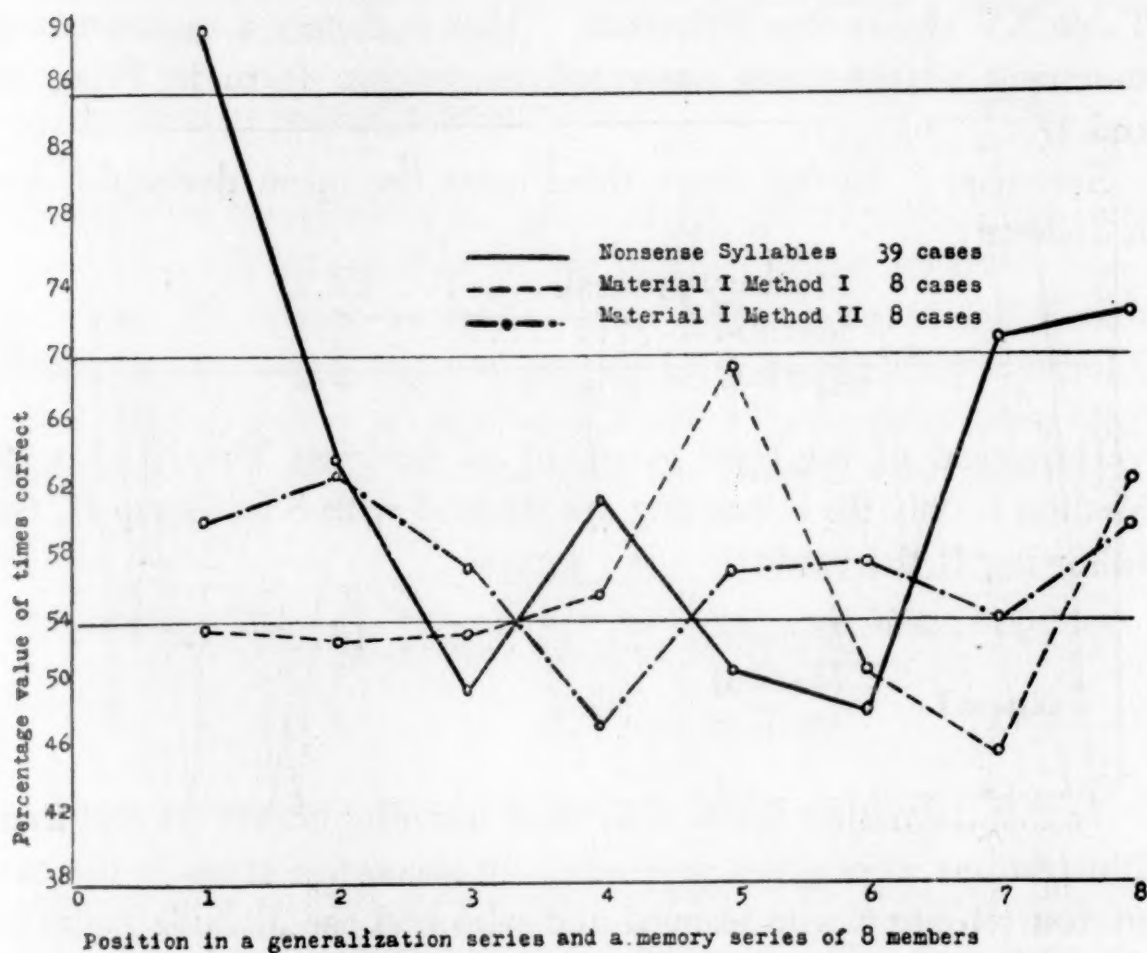


FIG. 17. Children: Percentage values of members in a series. All cases included learned in the time given.



terms of score on trials; thirdly, the irregularity from trial to trial is greater in the case of the subject who is going to generalize than in the case of the one who is not; fourth, the subject who generalized learned only two sets of the material in the same time that the subject who did not generalize took for learning three sets of the same material.

Table XVII and Fig. 19 show the difference in the case of two subjects with nearly the same I.Q., one learning with Method II instruction and the other with Method I instruction. The results show that the subject working with Method II learned faster than the subject working with Method I. A slightly better memory score is also indicated in the case of the Method II individual. In spite of this advantage, a week later with similar material the score shows that the subject with the poorer memory record working with Method I has a better score.

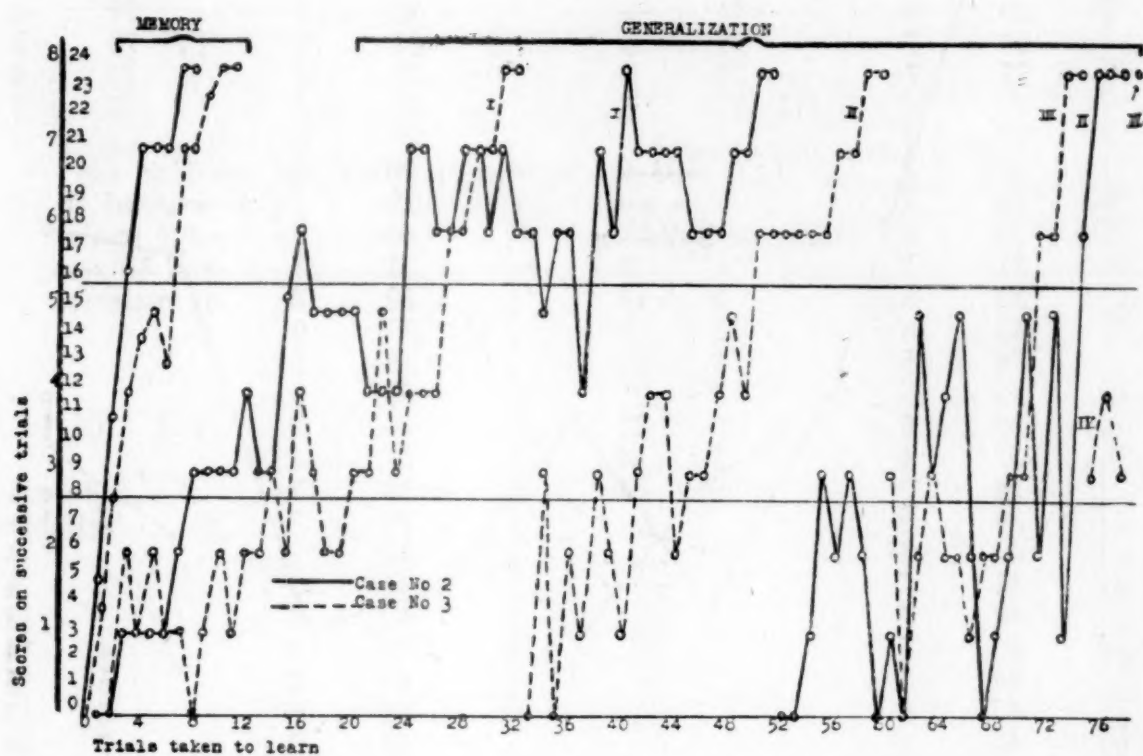


FIG. 18. Children: Comparison of two subjects working with the same instruction (Method I), one finally generalizing and the other not generalizing in the time given. The chart includes the learning records for the same length series of Nonsense Syllables for the same subjects. (I, II, and III, indicate successive sets of the same material.)

Scores on successive trials of two subjects both working with Method I, one finally learning and the other never arriving at a generalization.

| Subject 2, who learned on 75th trial. |     |       | Subject 3, who did not learn. |       |       |
|---------------------------------------|-----|-------|-------------------------------|-------|-------|
| Set                                   | Tr. | Score | Set                           | Tr.   | Score |
| I                                     | 1   | 0     | II                            | 52    | 0     |
|                                       | 2   | 0     |                               | 53    | 0     |
|                                       | 3   | 1     |                               | 54    | 1     |
|                                       | 4   | 1     |                               | 55    | 3     |
|                                       | 5   | 1     |                               | 56    | 2     |
|                                       | 6   | 1     |                               | 57    | 3     |
|                                       | 7   | 2     |                               | 58    | 2     |
|                                       | 8   | 3     |                               | 59    | 0     |
|                                       | 9   | 3     |                               | 60    | 1     |
|                                       | 10  | 3     |                               | 61    | 0     |
|                                       | 11  | 3     |                               | 62    | 5     |
|                                       | 12  | 4     |                               | 63    | 3     |
|                                       | 13  | 3     |                               | 64    | 4     |
|                                       | 14  | 3     |                               | 65    | 5     |
|                                       | 15  | 5     |                               | 66    | 2     |
|                                       | 16  | 6     |                               | 67    | 0     |
|                                       | 17  | 5     |                               | 68    | 1     |
|                                       | 18  | 5     |                               | 69    | 2     |
|                                       | 19  | 5     |                               | 70    | 5     |
|                                       | 20  | 5     |                               | 71    | 2     |
|                                       | 21  | 4     |                               | 72    | 5     |
|                                       | 22  | 4     |                               | 73    | 1     |
|                                       | 23  | 4     |                               | 74    | 6     |
|                                       | 24  | 7     |                               | 75    | 8     |
|                                       | 25  | 7     |                               | 76    | 8     |
|                                       | 26  | 6     | III                           | 77    | 8     |
|                                       | 27  | 6     |                               |       |       |
|                                       | 28  | 7     | I.Q.                          | 103.6 |       |
|                                       | 29  | 7     |                               |       |       |
|                                       | 30  | 6     | Nonsense Syllables            |       |       |
|                                       | 31  | 7     |                               | 1     | 5     |
|                                       | 32  | 6     |                               | 2     | 11    |
|                                       | 33  | 6     |                               | 3     | 16    |
|                                       | 34  | 5     |                               | 4     | 21    |
|                                       | 35  | 6     |                               | 5     | 21    |
|                                       | 36  | 6     |                               | 6     | 21    |
|                                       | 37  | 4     |                               | 7     | 24    |
|                                       | 38  | 7     |                               | 8     | 24    |
|                                       | 39  | 6     |                               |       |       |
|                                       | 40  | 8     |                               |       |       |
|                                       | 41  | 7     |                               |       |       |
|                                       | 42  | 7     |                               |       |       |
|                                       | 43  | 7     |                               |       |       |
|                                       | 44  | 7     |                               |       |       |
|                                       | 45  | 6     |                               |       |       |
|                                       | 46  | 6     |                               |       |       |
|                                       | 47  | 6     |                               |       |       |
|                                       | 48  | 7     |                               |       |       |
|                                       | 49  | 7     |                               |       |       |
|                                       | 50  | 8     |                               |       |       |
|                                       | 51  | 8     |                               |       |       |



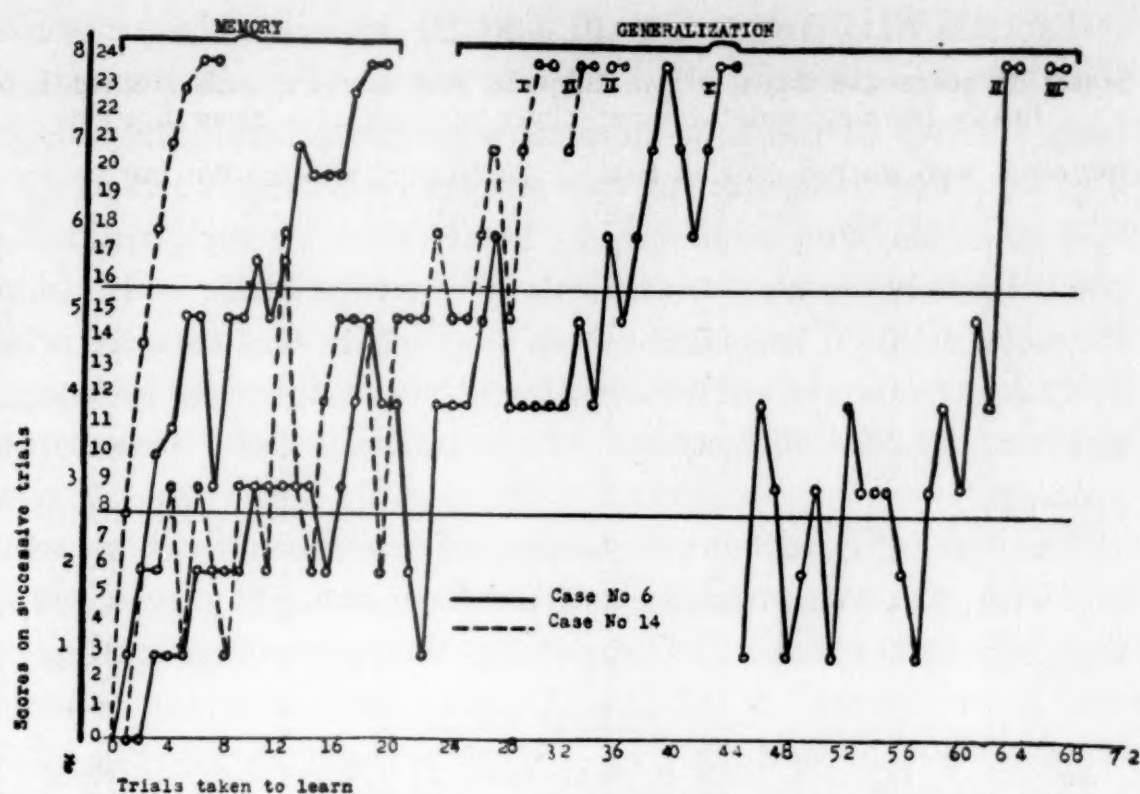


FIG. 19. Children: Comparison of the learning of two subjects with different instructions. The two are very nearly identical in I.Q. rating. One is working with Method I instruction and the other with Method II. (Roman numerals indicate successive sets of the same material.)

TABLE XVII

Subject 6, I.Q. 116, trials 64, recall score 32 (100 per cent)—Method I

Subject 14, I.Q. 108, trials 36, recall score 29 (97 per cent)

Subject 6, Method I

Subject 14, Method II

| Trials  | Memory Score | Generalization Sets | Score | Trials  | Memory Score | Generalization Sets | Score |
|---------|--------------|---------------------|-------|---------|--------------|---------------------|-------|
| 1.....  | 3            | I                   | 0     | 1.....  | 8            | I                   | 0     |
| 2.....  | 6            |                     | 0     | 2.....  | 14           |                     | 2     |
| 3.....  | 10           |                     | 1     | 3.....  | 18           |                     | 2     |
| 4.....  | 11           |                     | 1     | 4.....  | 21           |                     | 3     |
| 5.....  | 15           |                     | 1     | 5.....  | 23           |                     | 1     |
| 6.....  | 15           |                     | 2     | 6.....  | 24           |                     | 3     |
| 7.....  | 9            |                     | 2     | 7.....  | 24           |                     | 2     |
| 8.....  | 15           |                     | 2     | 8.....  |              |                     | 1     |
| 9.....  | 15           |                     | 2     | 9.....  |              |                     | 3     |
| 10..... | 17           |                     | 3     | 10..... |              |                     | 3     |
| 19..... | 24           |                     | 4     | 28..... |              |                     | 5     |
| 52..... |              |                     | 4     | 29..... |              |                     | 7     |
| 53..... |              |                     | 3     | 30..... |              |                     | 8     |
| 54..... |              |                     | 3     | 31..... |              |                     | 8     |
| 55..... |              |                     | 3     | 32..... |              |                     | 7     |
| 56..... |              |                     | 2     | 33..... |              |                     | 8     |
| 57..... |              |                     | 1     | 34..... |              |                     | 8     |
| 58..... |              |                     | 3     | 35..... |              |                     | 8     |
| 59..... |              |                     | 4     |         |              |                     |       |
| 60..... |              |                     | 3     |         |              |                     |       |
| 64..... |              |                     | 8     |         |              |                     |       |
| 65..... |              | II                  | 8     |         |              |                     |       |

(All of the detail omitted here with reference to scores on successive trials is given in figure 19.)

Table XVIII and Figs. 20 and 21 make a comparison of four subjects taking a short time to learn. Fig. 20 presents the facts for two of the four subjects with exceptionally high I.Q.'s. Fig. 21 presents results for two subjects with I.Q.'s near 100. In both cases learning occurred in a brief time. In each comparison one subject is learning with Method I and the other with Method II instruction. These facts show that where the learning occurs in so few trials, the present treatment is not adequate to bring to light all of the differences which possibly exist between the processes.

The same differences were indicated between individuals working with different attitudes as have been brought out as obtaining between groups. Comparing the percentage values of

TABLE XVIII

*Subject 9, I.Q. 138, trials 6, recall score 23 (71 per cent)—Method I*  
*Subject 17, I.Q. 125, trials 6, recall score 22 (69 per cent)—Method II*

| Subject 9 |              |                     |       | Subject 17 |              |                     |       |
|-----------|--------------|---------------------|-------|------------|--------------|---------------------|-------|
| Trials    | Memory Score | Generalization Sets | Score | Trials     | Memory Score | Generalization Sets | Score |
| 1.....    | 11           | I                   | 0     | 1.....     | 12           | I                   | 0     |
| 2.....    | 10           |                     | 3     | 2.....     | 18           |                     | 0     |
| 3.....    | 17           |                     | 5     | 3.....     | 18           |                     | 6     |
| 4.....    | 20           |                     | 7     | 4.....     | 24           |                     | 8     |
| 5.....    | 23           |                     | 7     | 5.....     | 21           |                     | 7     |
| 6.....    | 21           |                     | 8     | 6.....     | 24           |                     | 8     |
| 7.....    | 23           | II                  | 8     | 7.....     | 24           | II                  | 8     |
| 8.....    | 18           |                     |       |            |              |                     |       |
| 9.....    | 24           |                     |       |            |              |                     |       |
| 10.....   | 24           |                     |       |            |              |                     |       |

*Subject 29, I.Q. 99.2, Trials 14, Recall Score 21 (65 per cent)—Method I*  
*Subject 32, I.Q. 98.4, Trials 8, Recall Score 10 (31 per cent)—Method II*

| Subject 29, Method I |              |                     |       | Subject 32, Method II |              |                     |       |
|----------------------|--------------|---------------------|-------|-----------------------|--------------|---------------------|-------|
| Trials               | Memory Score | Generalization Sets | Score | Trials                | Memory Score | Generalization Sets | Score |
| 1.....               | 3            | I                   | 0     | 1.....                | 5            | I                   | 0     |
| 2.....               | 4            |                     | 6     | 2.....                | 10           |                     | 2     |
| 3.....               | 12           |                     | 4     | 3.....                | 10           |                     | 3     |
| 4.....               | 18           |                     | 5     | 4.....                | 13           |                     | 4     |
| 5.....               | 18           |                     | 7     | 5.....                | 19           |                     | 5     |
| 6.....               | 17           |                     | 7     | 6.....                | 18           |                     | 2     |
| 7.....               | 16           |                     | 6     | 7.....                | 18           |                     | 6     |
| 8.....               | 23           |                     | 5     | 8.....                | 23           |                     | 8     |
| 9.....               | 21           |                     | 5     | 9.....                | 24           | II                  | 8     |
| 10.....              | 24           |                     | 4     | 10.....               | 24           |                     |       |
| 11.....              | 24           |                     | 6     |                       |              |                     |       |
| 12.....              |              |                     | 6     |                       |              |                     |       |
| 13.....              |              |                     | 6     |                       |              |                     |       |
| 14.....              |              |                     | 6     |                       |              |                     |       |
| 15.....              |              | II                  | 8     |                       |              |                     |       |



different positions (pp. 42, 43, for discussion), it was found that in individual cases the process with Method I more nearly approximated the memory process than did the process with Method II. Table XIX shows in detail the differences between four cases learning with Method I and four cases learning with Method II. Both groups, four cases each, include two of the faster learners and two of the slower learners with the two different attitudes. In each case the individual's memory curve is also shown. These treatments are in terms of the per cent. of times a member in a given position is correct.

A graphic presentation brings out more clearly the facts in the above tables. A graph is therefore given for each case, showing the generalization process and the memory process of the individual on the same chart (Figs. 22 and 23). The following facts are of importance for this study: (1) Method II, both with the

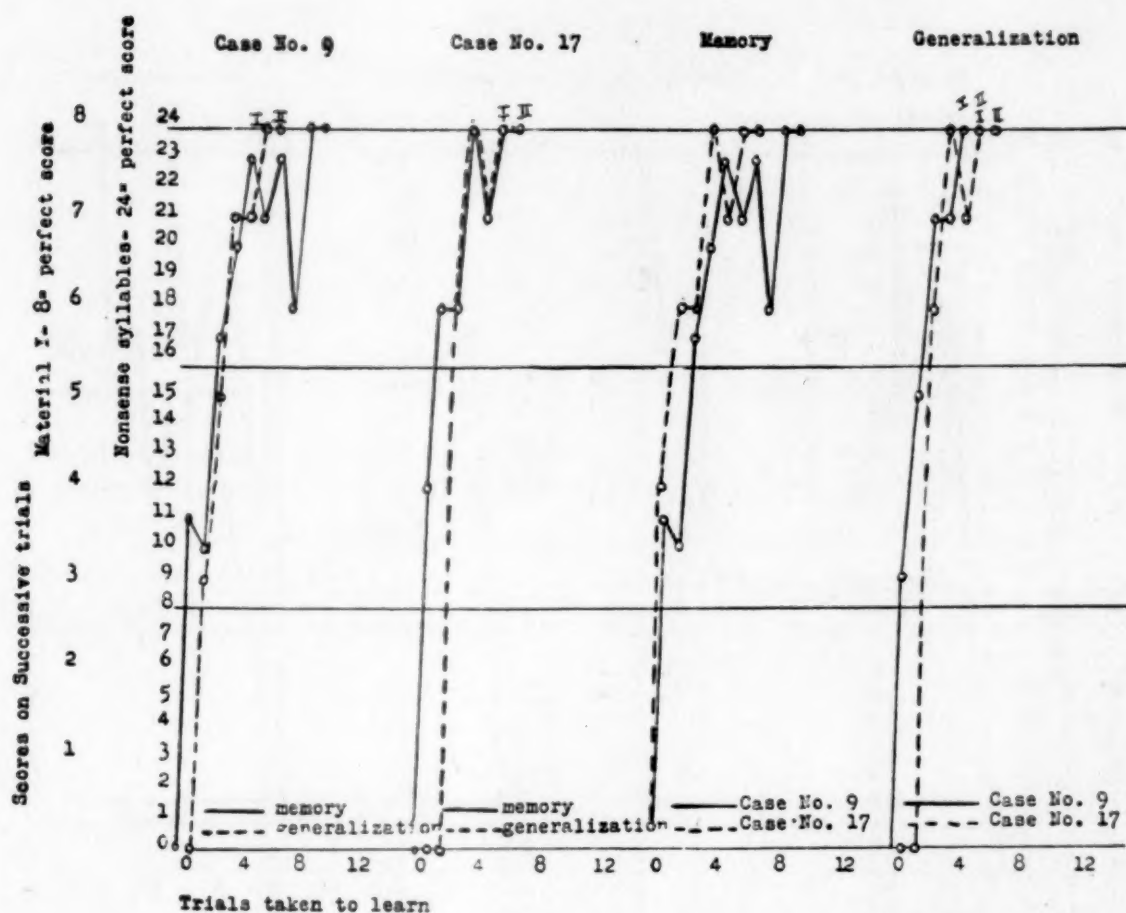


FIG. 20. Children: Comparison of learning of two subjects with high I.Q. ratings working with different instructions. Both take a relatively short time to learn. Subject 9 is learning with Method I attitude. Subject 17 is learning with Method II attitude.

slower learners and the faster learners, shows a greater difference from the memory process than did Method I; (2) with Method II, the second position in the series is as good or better than the first position in three cases of 4, while with Method I the second position is the same in value or inferior to the first position; (3) with Method I, the first two subjects (cases 30 and 3) show a drop on the fourth member of the series which, on account of its relation to 5, should offer an association to assist in learning. The last two subjects (cases 1 and 5), who generalized more quickly, show a rise on 4 which means that they were taking advantage of the association offered; (4) with Method II (cases 11, 14, 17, 18), the association offered with the particular syllables (4 and 5) seemed less important, that is, it did not raise the value of this position as much as was the case with Method I. This association was evidently of importance only in relation to the total generalization in the case of Method II.

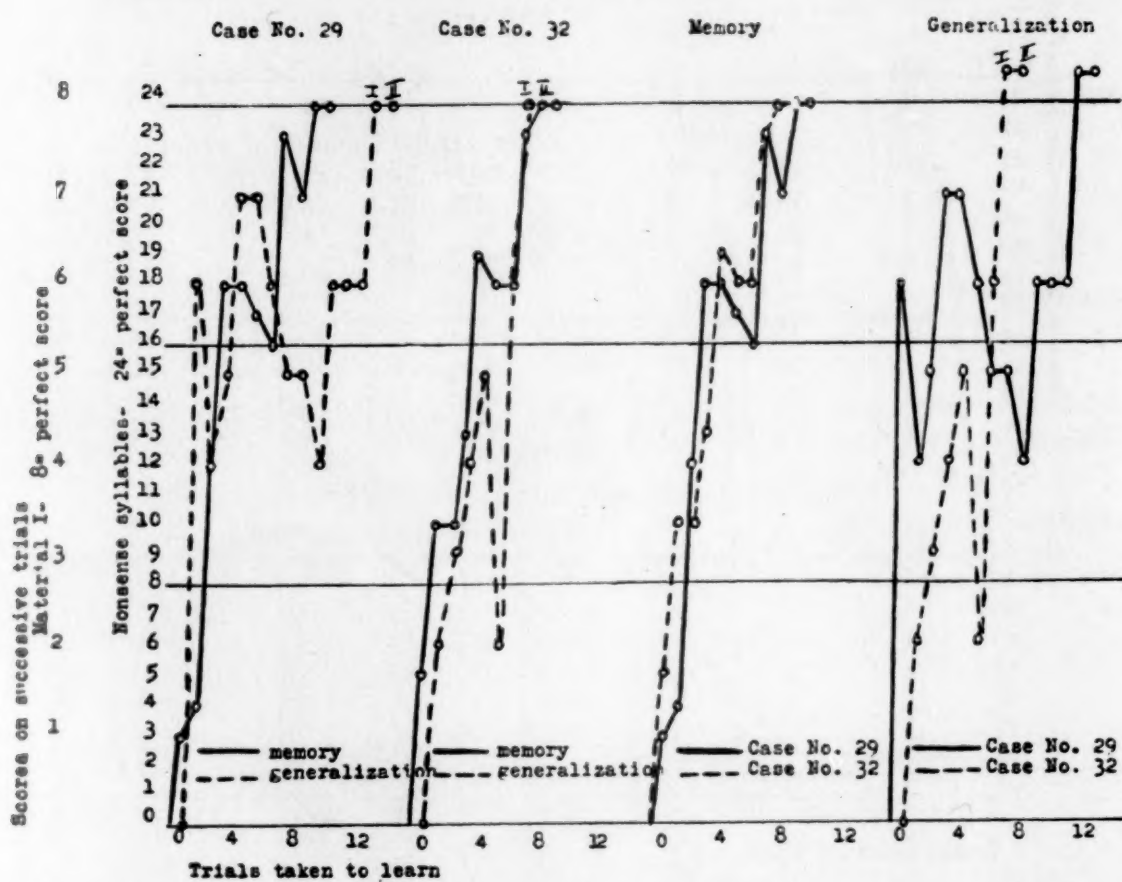


FIG. 21. Children: Comparison of learning of two subjects with I.Q. ratings near 100, both taking a short time to learn. Subject 29 is learning with Method I attitude. Subject 32 is learning with Method II attitude.



Table XX shows the relation of variation in position preference to the different processes. If the percentage value of each different position in the series is established by the method described (pp. 41, 45), namely, by dividing the number of times a member in a given position in a series is correct by the total number of trials taken to learn the series, then a mean percentage value can be obtained for the series, which value is a single measure of speed of learning as well as the mean value for the several positions. The mean deviation from this mean value is a measure of variation in value of different positions in the series. The table shows several things: (1) The mean value is higher in the case of the purely memory process than it is in the case of generalization with a series of the same length, meaning that the purely memory material takes the shorter time to learn; (2) the mean value is less in the case of Method I than Method II, meaning that having in mind the idea of generalization leads more quickly to

TABLE XIX

| I—Cases working with Method I   |          |                 |                    |       |      |      |      |      |       |      |
|---------------------------------|----------|-----------------|--------------------|-------|------|------|------|------|-------|------|
| Material I                      | Case No. | Trials to Learn | Position in Series |       |      |      |      |      |       |      |
|                                 |          |                 | 1                  | 2     | 3    | 4    | 5    | 6    | 7     | 8    |
| Per cent of times correct       |          |                 |                    |       |      |      |      |      |       |      |
| Memory                          | 30       | 75—             | 61.4               | 22.8  | 66.6 | 14.0 | 26.3 | 31.5 | 47.3  | 36.7 |
|                                 | 3        | 75—             | 45.1               | 61.0  | 54.8 | 31.0 | 46.9 | 59.2 | 53.9  | 46.9 |
|                                 | 1        | 31              | 90.3               | 80.6  | 29.3 | 67.7 | 54.8 | 51.6 | 45.1  | 54.8 |
|                                 | 5        | 16              | 37.5               | 37.5  | 25.0 | 37.5 | 56.2 | 43.7 | 43.7  | 62.5 |
|                                 | 30       | 19              | 100.0              | 85.9  | 47.3 | 78.9 | 40.3 | 57.8 | 94.7  | 89.4 |
|                                 | 3        | 10              | 100.0              | 50.0  | 36.6 | 76.6 | 36.6 | 23.3 | 60.0  | 63.3 |
|                                 | 1        | 14              | 80.8               | 64.2  | 21.3 | 35.7 | 71.4 | 27.7 | 73.7  | 71.4 |
|                                 | 5        | 2               | 80.8               | 72.1  | 36.0 | 66.1 | 91.6 | 50.0 | 80.5  | 80.5 |
| II—Cases working with Method II |          |                 |                    |       |      |      |      |      |       |      |
| Material I                      | Case No. | Trials to Learn | Position in Series |       |      |      |      |      |       |      |
|                                 |          |                 | 1                  | 2     | 3    | 4    | 5    | 6    | 7     | 8    |
| Per cent of times correct       |          |                 |                    |       |      |      |      |      |       |      |
| Memory                          | 11       | 41              | 58.5               | 60.9  | 48.7 | 43.9 | 46.3 | 53.6 | 58.5  | 41.4 |
|                                 | 14       | 36              | 25.0               | 58.3  | 58.3 | 66.6 | 91.6 | 30.5 | 33.3  | 69.4 |
|                                 | 17       | 6               | 66.6               | 50.0  | 50.0 | 66.6 | 66.6 | 66.6 | 66.6  | 66.6 |
|                                 | 18       | 4               | 75.0               | 75.0  | 75.0 | 50.0 | 75.0 | 75.0 | 75.0  | 75.0 |
|                                 | 11       | 27              | 82.7               | 50.5  | 45.6 | 86.4 | 61.7 | 28.4 | 71.5  | 77.7 |
|                                 | 14       | 6               | 94.3               | 100.0 | 77.6 | 66.6 | 27.6 | 61.0 | 94.3  | 94.3 |
|                                 | 17       | 4               | 100.0              | 75.0  | 25.0 | 75.0 | 75.0 | 75.0 | 100.0 | 75.0 |
|                                 | 18       | 18              | 94.4               | 37.0  | 44.4 | 31.4 | 66.6 | 53.6 | 79.6  | 72.3 |

Case 3. (Inadequate generalization became stabilized—not a pure memory process.)

generalizing; (3) the mean deviations are larger in the case of the memory process than in the case of either of the generalization processes, meaning that there is a greater difference in the values of different positions in the series with memory than with a process where generalization is occurring; (4) the values of the mean deviations are larger in the case of the process with Method I than with Method II, meaning that the process with Method I

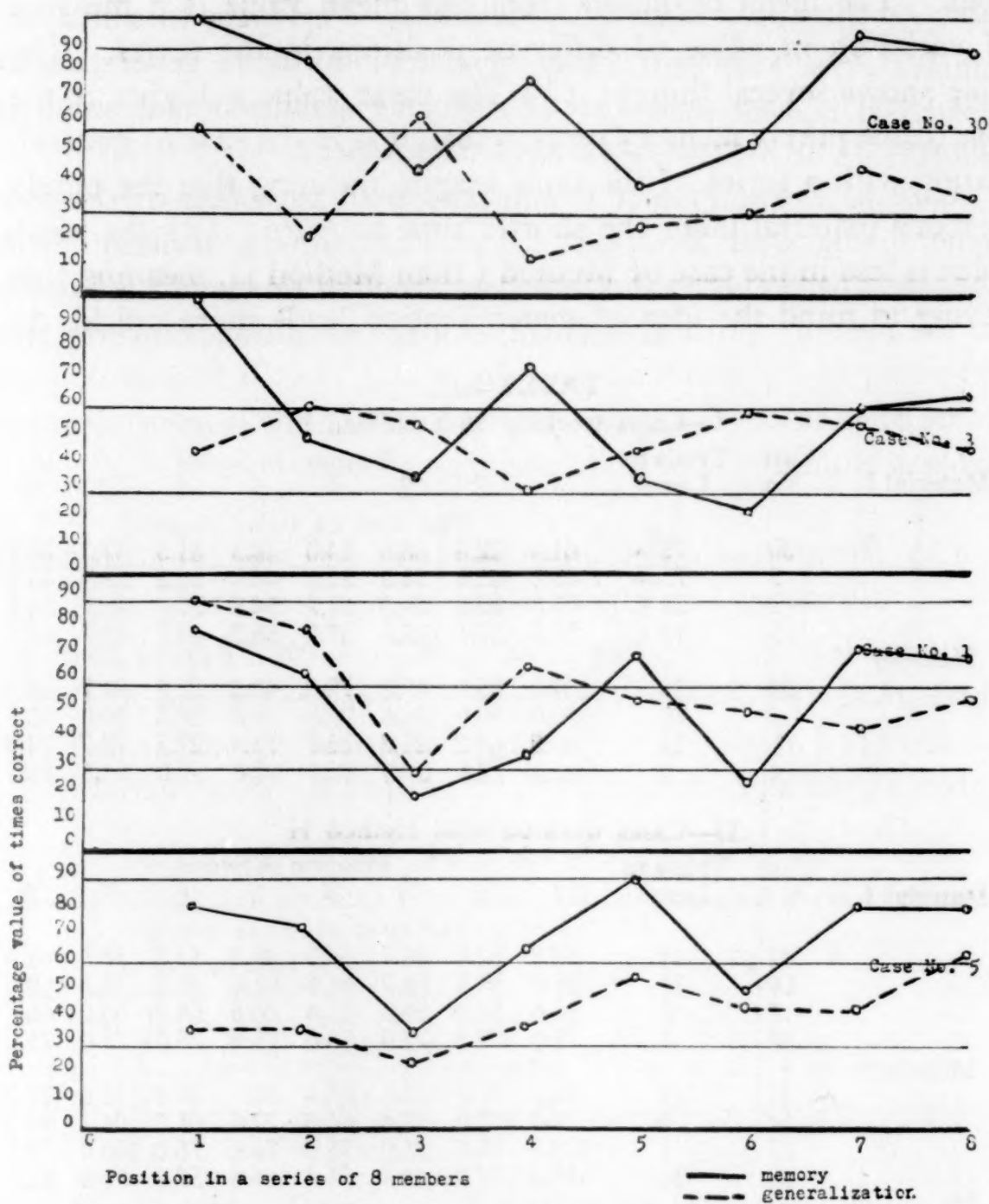


FIG. 22. Children: Four cases working with Method I attitude. Percentage values of positions in series.



had in it more of the memory process than the process with Method II and also that there is more of generalization from the beginning with Method II, which generalization leads to the ignoring of associations due to position.

All of the above facts are brought out more clearly in the group treatment of results (pp. 61, 64), but are evidenced in these individual samples.

Case 3 shows a smaller value for the mean deviation than any other of these four cases with Method I. This is the case analyzed (p. 67) before, showing that here an inadequate generalization did occur. This generalization became stabilized and stood in the way of the correct solution of the problem.

Case 14 shows greater irregularity than any other of the four generalizing with Method II; that is, the mean deviation from the mean percentage value is larger, seeming to suggest a likeness to the memory process. This is not the condition, however, for referring to the graph on page 76 of this case, it is seen that the value of positions is almost entirely reversed in the generalization process from that seen in the memory process.

(5) Relation of differences observed with different attitudes to differences in memory of the groups compared.

In making the comparisons of behavior with different attitudes three groups have been considered. These are Groups A, B, and C, described on page 51. These groups were equated in I.Q. and chronological age, as well as in school grade. Summarizing the

TABLE XX

Mean Percentage Values of position in a learning series and Mean Deviations from these mean values

| Case No. | Generalization Percentage Values |           |        | Generalization Mean Deviations from these Values |           |        |
|----------|----------------------------------|-----------|--------|--|-----------|--------|
|          | Method I                         | Method II | Memory | Method I   | Method II | Memory |
| 30.....  | 38.3                             |           | 74.2   | 15.0   |           | 19.3   |
| 3.....   | 49.8                             |           | 55.8   | 7.5  |           | 19.1   |
| 1.....   | 59.2                             |           | 55.7   | 15.1   |           | 20.6   |
| 5.....   | 42.9                             |           | 70.7   | 8.5  |           | 15.0   |
| 11.....  |                                  | 51.4      | 63.1   |  | 6.4       | 16.6   |
| 14.....  |                                  | 54.1      | 76.9   |  | 18.4      | 18.9   |
| 17.....  |                                  | 62.4      | 75.0   |  | 6.2       | 14.3   |
| 18.....  |                                  | 71.7      | 59.9   |  | 5.6       | 18.3   |

data with reference to the time taken to learn and also to relearn purely nonsense material, we found that the slight differences in memory of the groups cannot be considered statistically significant. Groups A, B, and C as first treated included 13 subjects each. Later a rearrangement was made of those subjects of Group A who learned, and subjects chosen from Groups B and C equated in intelligence and chronological age with the subjects of Group A who learned. The tables which follow make comparisons, first, of the total of Groups A, B, and C, and then of the limited Groups

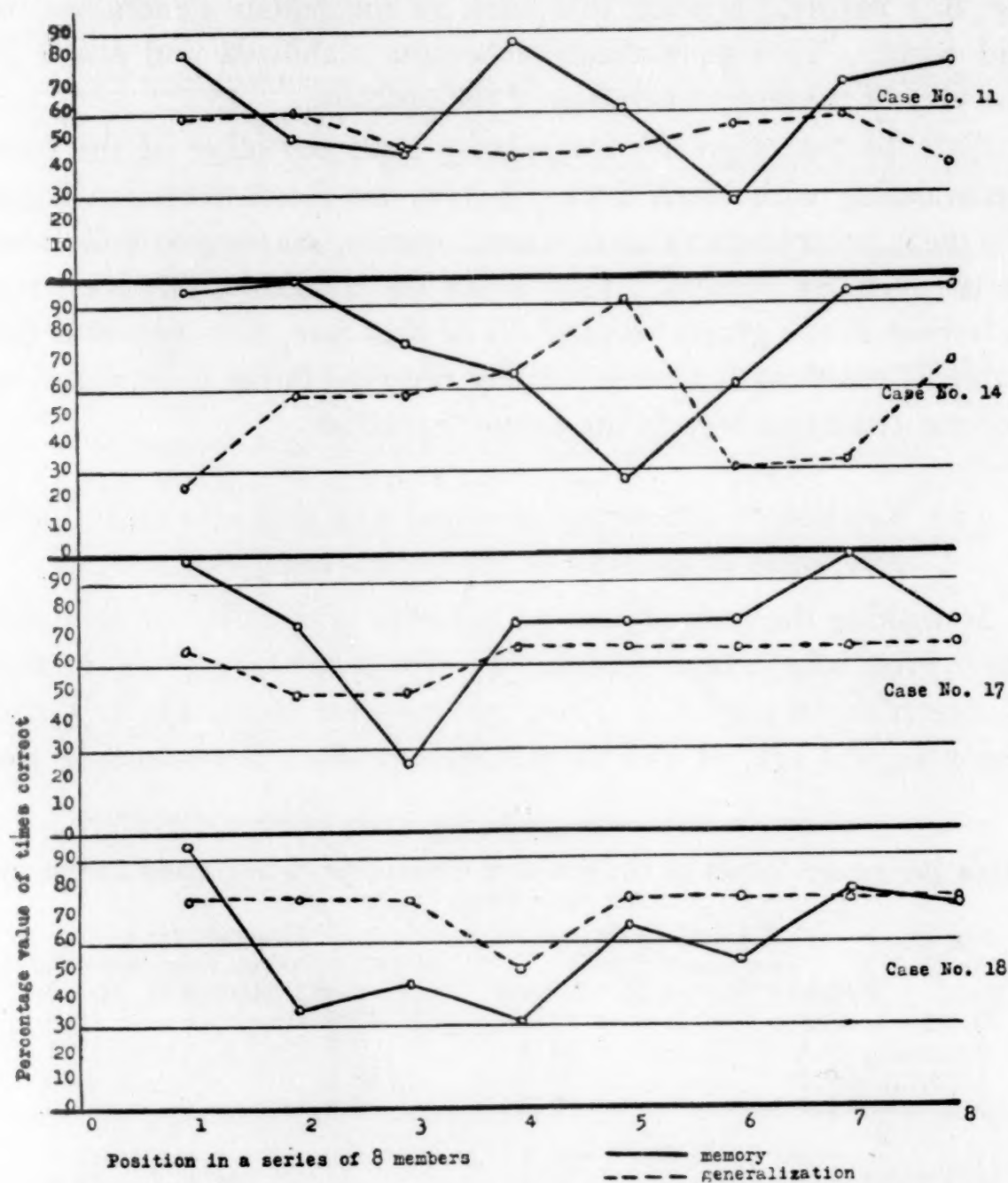


FIG. 23. Children: Four cases working with Method II attitude. Percentage values of positions in series.



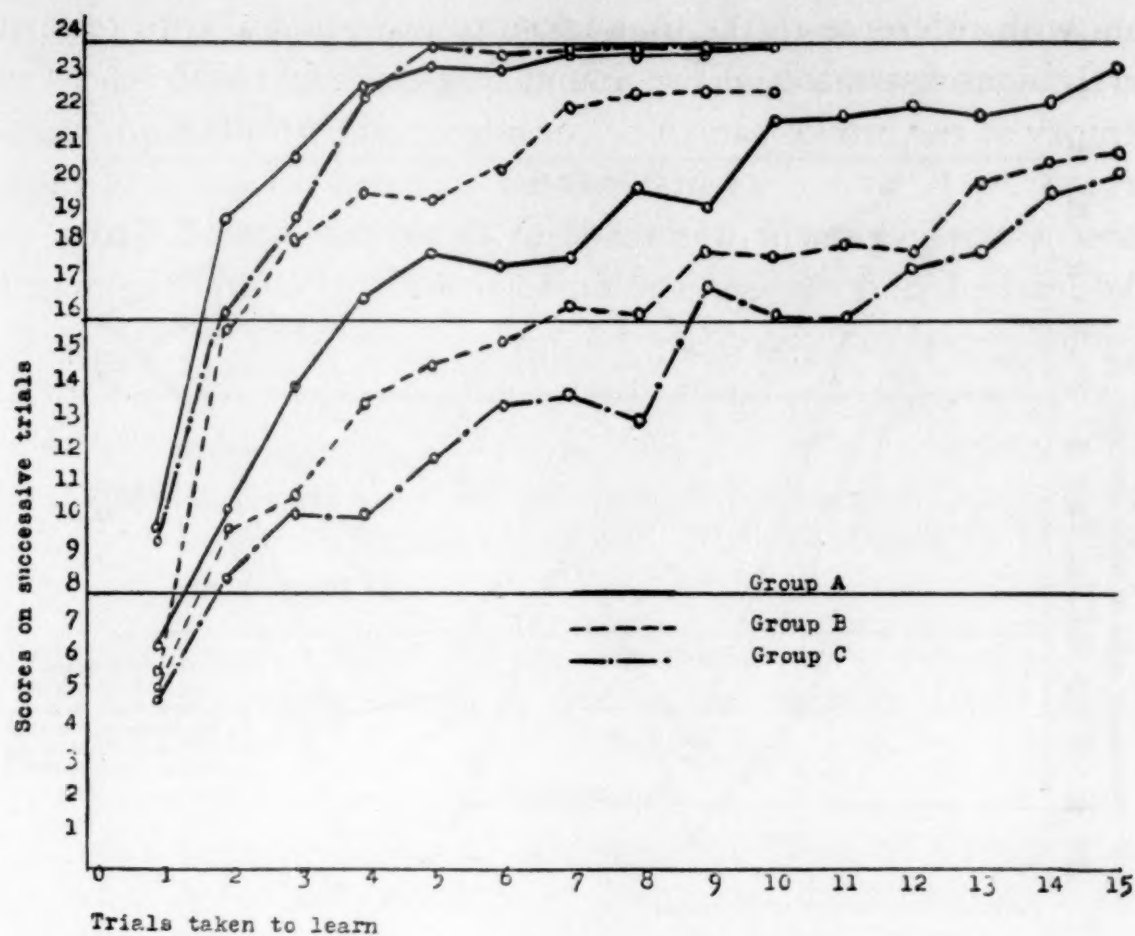


FIG. 24. Children: Comparison of learning curves of a memory series of Groups A, B, and C, used in Experiment I.

A, B, and C. There are indicated differences in Memory between the three groups. Although ordinary statistical devices do not prove these differences to be significant, their evidence is consistent enough to consider in interpreting differences of behavior of the groups. Groups A and B seem more nearly alike in memory factor both in learning and relearning. Group C is consistently slightly inferior to either of the other two groups. Tables XXI, Figs. 24 and 25, make clear this comparison.

TABLE XXI

Differences in Memory in groups of children studied  
Learning nonsense syllables (Means)

| Learning Trials        | Recall Score | Learning Trials                  | Recall Score |
|------------------------|--------------|----------------------------------|--------------|
| Group A (entire group) |              | Group A (limited group learning) |              |
| 11.4                   | 4.9          | 12.2                             | 5.5          |
| Group B (entire group) |              | Group B (limited group)          |              |
| 15.2                   | 5.6          | 12.3                             | 5.2          |
| Group C (entire group) |              | Group C (limited group)          |              |
| 17.0                   | 4.8          | 17.0                             | 4.5          |

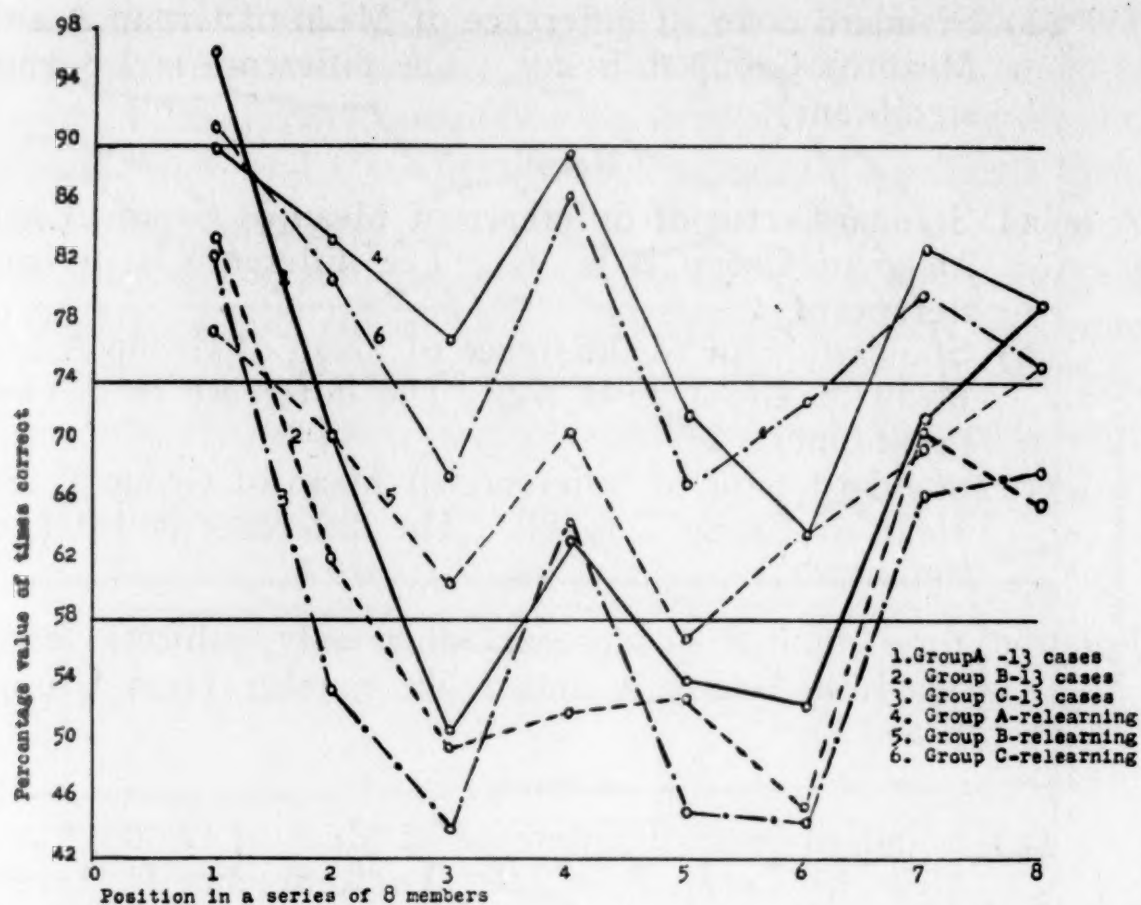


FIG. 25. Children: Comparison of the memory ability of Groups A, B, and C. Comparisons based on learning and relearning Nonsense Syllables. Percentage values of positions in series.

The above differences of means with the three groups bear such a relation to the standard errors of the differences as not to be considered necessarily significant. The following are the standard errors of the differences of the means:

The above differences of means with the three groups bear such a relation to the standard errors of the differences as not to be considered necessarily significant. The following are the standard errors of the differences of the means:

For the three groups of 13 subjects (entire group):

#### Learning

- (a) Standard error of difference of Mean of Group A and Mean of Group B is 2.5. The difference is 3.8.
- (b) Standard error of difference of Mean of Group A and Mean of Group C is 2.1. The difference is 5.6. (This is one difference which might be considered significant.)



- (c) Standard error of difference of Mean of Group A and Mean of Group C is 2.9. The difference is 1.8 (not significant).

#### Recall

- (a) Standard error of difference of Mean of Group A and Mean of Group B is .91. The difference is .9 (not significant).
- (b) Standard error of difference of Mean of Group A and Mean of Group C is .72. The difference is .1 (not significant).
- (c) Standard error of difference of Mean of Group B and Mean of Group C is .70. The difference is 1.0 (not significant).

For the three limited groups including only subjects learning from Group A and a like number from Groups B and C:

#### Learning

- (a) Standard error of difference of Mean of Group A and Mean of Group B is 2.9. The difference is .1 (not significant).
- (b) Standard error of difference of Mean of Group A and Mean of Group C is 3.12. The difference is 4.7 (not significant).
- (c) Standard error of difference of Mean of Group B and Mean of Group C is .87. The difference is 4.62 (not significant).

#### Recall

- (a) Standard error of difference of Mean of Group A and Mean of Group B is .7. The difference is .3 (not significant).
- (b) Standard error of difference of Mean of Group A and Mean of Group C is .5. The difference is 1.0 (possibly significant).
- (c) Standard error of difference of Mean of Group B and Mean of Group C is .6. The difference is .7 (not significant).

In addition to the above statistical comparison of the groups, a graphic treatment (p. 77) indicates the differences which, though they do not prove statistically significant, do possibly indicate differences which should be considered in interpreting

results. They seem to the writer to indicate a slight superiority of Groups A and B over Group C in learning, but little difference in the three groups in relearning.

(6) Ability to reproduce actual figures used.

At the end of the learning period, in the case of Material I with children, the child was asked to draw the figure having a given name. He could at this time name the figures correctly. Also, with the trial subjects, some were asked to reproduce figures even though they could not generalize. The general result in this reproduction was that it seemed that little of detail was noticed or rather remembered. This was an interesting side-product with reference to the main problem. The idea in mind and the needs of attention which it determined seemed to decide what of content should be noticed. One very interesting reaction which occurred in several cases was that the subject could reproduce two figures but could not reproduce the third. The third was used without difficulty but seemed to be learned by exclusion. It was not known directly but was known as the other of the three figures. Also, in the case of one of the trial subjects, even though a generalization had not occurred with enough completeness to function accurately, the subject was able, when asked, to define by reproduction the concept. The following points were of importance: First, there was an ability to use elements whose contents could not be reproduced; secondly, in some cases a generalization, in terms of ability to reproduce, occurred previous to ability to use this generalization; thirdly, in many cases the ability to use the material in a generalization is accompanied by the ability to reproduce only a part of the content of the material used; fourth, even where all three elements were reproduced, the reproduction was not exact but tended toward any association which the subject had used in remembering the part (the letter G for the part called "ga" which resembled this letter to some subjects, the letter H for the part called "ma" which resembled the letter H). All of the above points show that the actual content of the material was noted only so far as was necessary to satisfy the demands of its use, and that this selection was therefore a function of the idea in mind.



g. Summary of results of Experiment I with children.

(1) The chance of generalization is less and the time taken longer in the case of Method I, which leaves the subject with no instruction about the possibility of generalizing, than with Method II, which instructs the subject to seek a generalization, or with Method III, where the generalization is given outright.

(2) Within the limits of the attitude, intelligence is a large factor in determining the chance of generalizing and the speed of generalizing when it occurs.

(3) Comparing those who learn with Method I instruction with equal groups working with Method II and Method III the writer found that the recall or functioning of the generalization is more complete at a later time if Method I instruction was given at the time of learning.

(4) Method II is superior to Method III in recall score one week after learning.

(5) The result seems to show that, with Method I, there is a difference in the approach of different subjects. That is, in the absence of definite instructions, the subject sets for himself some problem which determines his behavior. With Methods II and III, the instructions are more definite, and as far as objective records show, the processes of different subjects are more nearly the same.

(6) Qualitative differences in the process are observable in the case of subjects working with different attitudes. These are shown by different types of learning curves of scores on successive trials and different preference values for different positions in a series.

(7) The qualitative differences observable if groups are compared are also evidenced in cases of treatment of individual learning curves of subjects working with different instructions.

(8) The attitude described as Method I (p. 41) resembles more nearly the memory process in learning a nonsense series than does the attitude described as Method II. The preference of the first member of a series which is characteristic of the memory process is characteristic also of the generalization process with

Method I. With the same generalization series, the subjects working with Method II show that the preference is for the second member of the series.

(9) Indications of difference of approach are present from the beginning in the case of subjects working with Method I who finally generalize. The most noticeable difference is that those who do generalize are taking advantage of individual associations offered, and those who do not are, in most cases, not taking advantage of these associations.

(10) The slight differences in memory of groups and individuals do not account for difference in the functional value of concepts arrived at with different attitudes at the time of learning. In many cases the memory differences favor the least successful or least valuable generalization.

(11) In the case of successful functioning of a generalization there is not always ability to reproduce the elements which can be successfully used. Elements can be used without ability to reproduce the same, elements can be reproduced without ability to use, and elements can be noted by exclusion without further attention and yet be used successfully.

### C. Experiment II, with Whittier Group

#### a. Statement of Problem.

The problem in this experiment was to study the effect of difference of intelligence in modifying the effect of the attitude of work. The same attitudes and controls of attitudes were used as had been tried with the previous groups. The same instructions and an identical procedure were used.

#### b. Materials.

The materials used were Materials I and II of the generalization type (pp. 30, 31, and pp. 33, 34). Nonsense syllable Series I in booklet form (p. 38) was employed. In addition, the record sheets described (pp. 41, 42) and stop watch were used.

#### c. Subjects.

This group consisted of 48 boys at the Whittier State School. The total 16-year-old group of boys present at the time of this



experiment served as subjects. This group could be used for this purpose because the general mental level is low in comparison with the other two groups used. Also, by dividing this group into a lower and higher group, distinctions could be observed in the behavior of these two sections. The mean of chronological age for this group was 15.8 years; standard deviation, .278 years; range from 15.5 to 16.5 years. The intelligence quotient was used here as the most direct data for equating for intelligence. On account of the differences in time of giving the tests, the mental age was not directly available, though it could have been computed. In this case an equation in I.Q.'s means an equation in mental ages. The narrow range of chronological age makes this true. The mean of intelligence quotients was 79, the standard deviation was 9.9 points, and the range from 56 to 98 points.

The same method of arranging subjects in groups of equal mentality as described for children (p. 47) was followed with this group. The details of the constitution of this group as well as the final mentally equated groups are shown in Table XXII.

TABLE XXII

## Whittier Group

(Number represents key to subject in terms of alphabetical arrangement.)

| Case No.                     | I.Q. | Chronological Age |        |      |
|------------------------------|------|-------------------|--------|------|
|                              |      | Years             | Months | Days |
| 37.....                      | 56*  | 16—               | 3—     | 15   |
| 26.....                      | 68   | 15—               | 8—     | 11   |
| 10.....                      | 69   | 15—               | 11—    | 20   |
| 27.....                      | 73   | 15—               | 9—     | 28   |
| 31.....                      | 75   | 15—               | 10—    | 17   |
| 34.....                      | 77   | 15—               | 6—     | 26   |
| 38.....                      | 78   | 15—               | 6—     | 15   |
| 3.....                       | 79   | 15—               | 9—     | 28   |
| 9.....                       | 80   | 15—               | 9—     | 14   |
| 1.....                       | 82   | 15—               | 8—     | 23   |
| 5.....                       | 82   | 15—               | 0—     | 24   |
| 35.....                      | 88   | 15—               | 9—     | 18   |
| 11.....                      | 92   | 16—               | 2—     | 11   |
| 32.....                      | 98   | 15—               | 7—     | 0    |
| 48.....                      | 98   | 15—               | 7—     | 13   |
| Mean = 79.6                  |      | = 15.8 years      |        |      |
| Standard Error = 10.9        |      | = .347 "          |        |      |
| Standard Error of Mean = 2.8 |      | = .089 "          |        |      |

\* This subject was only temporarily an inmate of Whittier. The school does not attempt to handle such cases.

## Group B

| Case No.                      | I.Q. | Chronological Age |        |      |
|-------------------------------|------|-------------------|--------|------|
|                               |      | Years             | Months | Days |
| 18.....                       | 63   | 15—               | 4—     | 0    |
| 19.....                       | 66   | 15—               | 6—     | 23   |
| 6.....                        | 70   | 16—               | 3—     | 8    |
| 2.....                        | 72   | 15—               | 10—    | 15   |
| 13.....                       | 73   | 16—               | 0—     | 3    |
| 23.....                       | 75   | 16—               | 2—     | 19   |
| 36.....                       | 76   | 15—               | 11—    | 18   |
| 21.....                       | 77   | 15—               | 10—    | 24   |
| 43.....                       | 78   | 15—               | 8—     | 17   |
| 28.....                       | 81   | 15—               | 7—     | 14   |
| 22.....                       | 81   | 15—               | 8—     | 15   |
| 47.....                       | 82   | 15—               | 8—     | 23   |
| 13.....                       | 83   | 16—               | 0—     | 6    |
| 15.....                       | 85   | 15—               | 6—     | 4    |
| 17.....                       | 86   | 15—               | 7—     | 24   |
| 24.....                       | 91   | 15—               | 8—     | 3    |
| 44.....                       | 93   | 16—               | 4—     | 12   |
| 20.....                       | 97   | 15—               | 9—     | 19   |
| Mean = 79.3                   |      | = 15.8 years      |        |      |
| Standard Error = 8.82         |      | = .25 "           |        |      |
| Standard Error of Mean = 2.08 |      | = .058 "          |        |      |

## Group C

| Case No.                     | I.Q. | Chronological Age |        |      |
|------------------------------|------|-------------------|--------|------|
|                              |      | Years             | Months | Days |
| 25.....                      | 61   | 15—               | 6—     | 26   |
| 29.....                      | 62   | 15—               | 10—    | 21   |
| 45.....                      | 71   | 16—               | 2—     | 23   |
| 4.....                       | 73   | 15—               | 6—     | 20   |
| 7.....                       | 73   | 16—               | 0—     | 16   |
| 30.....                      | 74   | 16—               | 0—     | 6    |
| 41.....                      | 75   | 16—               | 0—     | 19   |
| 33.....                      | 78   | 16—               | 3—     | 21   |
| 16.....                      | 82   | 15—               | 7—     | 10   |
| 12.....                      | 84   | 15—               | 9—     | 23   |
| 8.....                       | 86   | 15—               | 6—     | 27   |
| 39.....                      | 88   | 15—               | 10—    | 24   |
| 42.....                      | 90   | 15—               | 8—     | 14   |
| 40.....                      | 94   | 16—               | 1—     | 10   |
| 46.....                      | 95   | 16—               | 0—     | 7    |
| Mean = 79.0                  |      | = 15.8 years      |        |      |
| Standard Error = 10.1        |      | = .237 "          |        |      |
| Standard Error of Mean = 2.6 |      | = .061 "          |        |      |

NOTE—All mental test scores were from records of mental tests given within one year. In the case of 75 per cent. of the subjects, the tests had been given within 3 months or less. Fifty per cent. of the subjects had two tests or more, in which cases the mean score of the tests was used. The test results used were the results of tests given by the Whittier State School Research Department and of tests given by Dr. S. C. Fisher of the Juvenile Hall Research Department of the county of Los Angeles.



These three groups may be considered equivalent in chronological age and intelligence. The difference of means and the standard errors of these differences are shown in Table XXIII.

TABLE XXIII

## Intelligence Quotients

|   |            |
|---|------------|
| Standard error of diff. of Mean A and Mean B = 3.48 | Diff. = .3 |
| Standard error of diff. of Mean A and Mean C = 3.82 | Diff. = .3 |
| Standard error of diff. of Mean B and Mean C = 3.32 | Diff. = .3 |

None of the above differences are significant.

## Chronological Age

|  |              |
|--|--------------|
| Standard error of diff. of Mean A and Mean B = .106 yrs. | Diff. = .004 |
| Standard error of diff. of Mean A and Mean C = .107 "    | Diff. = .07  |
| Standard error of diff. of Mean B and Mean C = .084 "    | Diff. = .07  |

None of the above differences are significant.

## d. Procedure in this experiment.

The same procedure was carried out with this group as had been used with the group of children in the previous experiment (pp. 40-43). In addition to Material I, which was learned by the children, this group of subjects learned Material II. Table XXIV outlines the order of learning of the two materials and the instructions given in each case.

TABLE XXIV

## Order of Presentation of Materials to Different Groups

Group A—Material I —Method I  
Material II—Method III

Group B—Material II—Method I  
Material I —Method II

Group C—Material I —Method III  
Material II—Method II

With both difficulties of material an arbitrary limit of number of presentations was allowed for learning with Methods I and II. This number of trials was 25. This was a shorter period than was allowed for the children. This shorter period allowed for greater statistical validity, since more cases could be handled in the same amount of time. Also this shorter period of time exaggerated differences in learning.

In the case of Method III with this group of subjects, three successive presentations each of Series I, II, and III were given and one presentation of Series IV. The subject was then required to name the first two members of Series V. This gave 10 presentations for learning with Method III.

The same instructions were used here to control the attitude as had been used with children (p. 45). Also the same methods of presenting the material and of recording and treating the results were used as in Experiment I.

e. Results of Experiment II, Whittier Group.

(1) Number learning with variations of Attitude I.

The results reported here refer to variations of attitude due to instructions called Methods I, II, and III. The results show that the chance of learning with material that requires a generalization is least with Method I and greatest with Method III. If the more difficult material is used, this difference becomes greater. Table XXV shows the number and per cent. learning in the time given with the different difficulties of material.

TABLE XXV

Number and per cent of subjects learning with different instructions and different difficulties of material

| Mean<br>I.Q.<br>79.3 | Number Learning                       |          |           |             |          |           |
|----------------------|---------------------------------------|----------|-----------|-------------|----------|-----------|
|                      | Material I                            |          |           | Material II |          |           |
|                      | Meth. I                               | Meth. II | Meth. III | Meth. I     | Meth. II | Meth. III |
|                      | 9 of 15                               | 14 of 18 | 15 of 15  | 6 of 18     | 8 of 15  | 15 of 15  |
|                      | Same as above in terms of percentages |          |           |             |          |           |
|                      | 60                                    | 77       | 100       | 33          | 53       | 100       |

Table XXV shows that with Material I, if Method I is given, 40 per cent. fail to learn; with Method I, 67 per cent. fail to learn Material II. If Method II is given, only 23 per cent. fail to learn Material I, and 47 per cent. to learn Material II. With either material no subject fails to learn in the time given with Method III.

Table XXVI presents details of data with reference to time taken to learn different materials with different attitudes. From data of this type the above summaries were made.



TABLE XXVI

Whittier Group

Details with reference to learning and recall of generalization material with different attitudes of work

| Case No. | Group A     |                       |                          |             |                    |               |
|----------|-------------|-----------------------|--------------------------|-------------|--------------------|---------------|
|          | Learning    |                       |                          | Recall      |                    |               |
|          | N.S. Trials | Mat. I Meth. I Trials | Mat. II Meth. III Trials | N.S. Trials | Mat. I Score       | Mat. II Score |
| 37.....  | 10          | 25—                   | 10                       | 5           | 12                 | 3             |
| 26.....  | 8           | 19                    | 10                       | 2           | 31                 | 21            |
| 10.....  | 8           | 25—                   | 10                       | 3           | 7                  | 9             |
| 27.....  | 15          | 25—                   | 10                       | 5           | 7                  | 7             |
| 31.....  | 8           | 25—                   | 10                       | 2           | 0                  | 10            |
| 34.....  | 7           | 11                    | 10                       | 2           | 30                 | 24            |
| 38.....  | 5           | 9                     | 10                       | 2           | 32                 | 29            |
| 3.....   | 5           | 23                    | 10                       | 3           | 27                 | 9             |
| 9.....   | 5           | 4                     | 10                       | 3           | 32                 | 32            |
| 1.....   | 7           | 24                    | 10                       | 4           | 17                 | 14            |
| 5.....   | 4           | 25—                   | 10                       | 4           | 6                  | 32            |
| 35.....  | 13          | 25—                   | 10                       | 3           | 0                  | 17            |
| 11.....  | 5           | 11                    | 10                       | 3           | 32                 | 16            |
| 32.....  | 9           | 3                     | 10                       | 3           | 32                 | 32            |
| 48.....  | 5           | 4                     | 10                       | 4           | 32                 | 32            |
| Means    | 7.6         | 12(9)<br>25(6—)       | 10                       | 3.2         | 29.4(9)<br>5.4(6—) | 19.1          |

Minus after number means subject did not learn with this number of trials in learning, or that subject is recalling this incompletely learned material.

N.S. refers to the learning and relearning of nonsense syllables.

| Case No. | Group B     |                        |                        |             |                     |                     |
|----------|-------------|------------------------|------------------------|-------------|---------------------|---------------------|
|          | Learning    |                        |                        | Recall      |                     |                     |
|          | N.S. Trials | Mat. II Meth. I Trials | Mat. I Meth. II Trials | N.S. Trials | Mat. I Score        | Mat. II Score       |
| 18.....  | 6           | 25—                    | 25—                    | 4           | 5                   | 0                   |
| 19.....  | 15          | 9                      | 10                     | 4           | 11                  | 32                  |
| 6.....   | 8           | 25—                    | 4                      | 5           | 5                   | 30                  |
| 2.....   | 9           | 25—                    | 5                      | 3           | 31                  | 2                   |
| 13.....  | 11          | 25—                    | 19                     | 3           | 8                   | 0                   |
| 23.....  | 8           | 25—                    | 10                     | 2           | 19                  | 0                   |
| 36.....  | 9           | 7                      | 5                      | 2           | 32                  | 32                  |
| 21.....  | 14          | 25—                    | 25—                    | 3           | 0                   | 0                   |
| 43.....  | 9           | 25—                    | 25—                    | 1           | 6                   | 0                   |
| 28.....  | 6           | 25—                    | 6                      | 6           | 19                  | 0                   |
| 22.....  | 7           | 19                     | 6                      | 5           | 31                  | 20                  |
| 47.....  | 27          | 20                     | 16                     | 7           | 5                   | 5                   |
| 14.....  | 7           | 25—                    | 25—                    | 1           | 11                  | 1                   |
| 15.....  | 11          | 8                      | 3                      | 5           | 29                  | 18                  |
| 17.....  | 8           | 25—                    | 3                      | 3           | 26                  | 0                   |
| 24.....  | 13          | 25—                    | 12                     | 3           | 16                  | 25                  |
| 44.....  | 7           | 8                      | 3                      | 1           | 32                  | 22                  |
| 20.....  | 10          | 25—                    | 5                      | 3           | 17                  | 10                  |
| Means    | 10.2        | 11.8(6)<br>25(12—)     | 7.6(14)<br>25(4—)      | 3.32        | 20.1(14)<br>5.5(4—) | 21.5(6)<br>5.7(12—) |

| Case No. | Group C     |                         |                         |             |              |                  |
|----------|-------------|-------------------------|-------------------------|-------------|--------------|------------------|
|          | Learning    |                         |                         | Recall      |              |                  |
|          | N.S. Trials | Mat. I Meth. III Trials | Mat. II Meth. II Trials | N.S. Trials | Mat. I Score | Mat. II Score    |
| 25.....  | 13          | 10                      | 25—                     | 5           | 17           | 4                |
| 29.....  | 16          | 10                      | 10                      | 9           | 28           | 18               |
| 45.....  | 8           | 10                      | 25—                     | 3           | 11           | 3                |
| 4.....   | 13          | 10                      | 25—                     | 4           | 12           | 0                |
| 7.....   | 12          | 10                      | 25—                     | 4           | 16           | 0                |
| 30.....  | 9           | 10                      | 6                       | 5           | 17           | 21               |
| 41.....  | 10          | 10                      | 10                      | 4           | 12           | 10               |
| 33.....  | 10          | 10                      | 14                      | 2           | 19           | 12               |
| 16.....  | 9           | 10                      | 14                      | 5           | 11           | 5                |
| 12.....  | 4           | 10                      | 10                      | 4           | 14           | 23               |
| 8.....   | 8           | 10                      | 12                      | 3           | 9            | 7                |
| 39.....  | 7           | 10                      | 25—                     | 3           | 17           | 4                |
| 42.....  | 5           | 10                      | 25—                     | 3           | 16           | 6                |
| 40.....  | 8           | 10                      | 11                      | 4           | 22           | 20               |
| 46.....  | 8           | 10                      | 25—                     | 1           | 23           | 4                |
| Means    | 9.3         | 10                      | 10.8(8)<br>25(7—)       | 3.9         | 16.3         | 14.5(8)<br>3(7—) |

(2) Relation of Intellectual status to chance of learning.

If the subjects selected are divided into two groups, one of higher and the other of lower intellectual status, it is found that the chance of learning with any given attitude is dependent in part upon intelligence. Table XXVII better than any correlation statement presents the facts of relationship of intelligence to chance of learning with the particular idea or attitude.

Table XXVII shows that of those failing to generalize with Method I, the larger per cent. comes from the lower end of the intellectual scale. It shows also that with this difficulty of material and this limitation of time those of the lower end of the scale can get the generalization with Method III in 100 per cent. of cases.

TABLE XXVII

Number and per cent learning divided in terms of mentality

| I.Q.                                    | Material I |          |           | Material II |          |           |
|---|------------|----------|-----------|-------------|----------|-----------|
|   | Meth. I    | Meth. II | Meth. III | Meth. I     | Meth. II | Meth. III |
| 50-79                                   | 4 of 8     | 6 of 9   | 8 of 8    | 2 of 9      | 4 of 8   | 8 of 8    |
| 80-100                                  | 5 of 7     | 8 of 8   | 7 of 7    | 4 of 9      | 4 of 7   | 7 of 7    |
| (Same as above in terms of percentages) |            |          |           |             |          |           |
| 50-79                                   | 50         | 66       | 100       | 22          | 50       | 100       |
| 80-100                                  | 71         | 88       | 100       | 44          | 57       | 100       |



The use of the correlation method of determining the relationship between intelligence and chance of learning brought out some interesting facts. The results differed somewhat from those observed with children. This is due in part to the fact that the range of intelligence of this group was narrower than that of the group of children. The result of this difference of range would be that a smaller correlation would have greater significance.

Using the bi-serial method, the following correlations were found to exist between intelligence on the one side and generalizing or not generalizing on the other side:

- (a) Correlation of I.Q. and chance of generalizing with Material I, Method I . . . . .55; Standard Error of  $r$  . . . . .24.
- (b) Correlation of I.Q. and chance of generalizing with Material I, Method II . . . . .40; Standard Error of  $r$  . . . . .28.
- (c) Correlation of I.Q. and chance of generalizing with Material II, Method I . . . . .12; Standard Error of  $r$  . . . . .06.
- (d) Correlation of I.Q. and chance of generalizing with Material II, Method II . . . . .31; Standard Error of  $r$  . . . . .30.

The above correlations show that with this lower mentality group there is a higher correlation between intelligence and chance of generalizing with Method I if the simpler materials are used (Material I) than with the more complex material. The material bears in this case a certain difficulty relation to the subject's learning. ✓

Using the product moment method of correlation, a relationship was discovered between the time taken to generalize, when learning occurred, and I.Q. of subjects learning. The following correlations were found to exist:

- (a) Correlation of I.Q. and speed of generalizing with Material I, Method I . . . . .57; Standard Error of  $r$  . . . . .22.
- (b) Correlation of I.Q. and speed of generalizing with Material I, Method II . . . . .011; Standard Error of  $r$  . . . . .33.
- (c) Correlation of I.Q. and speed of generalizing with Material II, Method I . . . . .13; Standard Error of  $r$  . . . . .40.
- (d) Correlation of I.Q. and speed of generalizing with Material II, Method II . . . . .08; Standard Error of  $r$  . . . . .41.

The above correlations show that if chance of generalizing is eliminated as a factor, there is no correlation between speed of generalizing and I.Q. except in the case of Material I, Method I.

(3) Relative efficiency of Methods I, II, and III when learning occurs.

The subjects learning with Method I were equated with subjects from the other two groups learning and a comparison was made of the functional value of the generalization three days after learning occurred. The number of subjects in the three equal groups was greater for Material I than for Material II because more subjects learned the easier material in the time given.

Table XXVIII gives the details of response of the three groups to Material I.

TABLE XXVIII

## Material I

Three groups of equal mentality who learned with different instructions

|                            | Method I (Group A) |        |        | Method II (Group B) |        |        | Method III (Group C) |        |        |
|----------------------------|--------------------|--------|--------|---------------------|--------|--------|----------------------|--------|--------|
|                            | I.Q.               | Learn. | Recall | I.Q.                | Learn. | Recall | I.Q.                 | Learn. | Recall |
|                            |                    | Trials | Score  |                     | Trials | Score  |                      | Trials | Score  |
|                            | 68                 | 19     | 31     | 70                  | 4      | 5      | 71                   | 10     | 11     |
|                            | 77                 | 11     | 30     | 75                  | 10     | 19     | 75                   | 10     | 12     |
|                            | 78                 | 9      | 32     | 76                  | 5      | 32     | 78                   | 10     | 19     |
|                            | 78                 | 23     | 27     | 81                  | 6      | 19     | 82                   | 10     | 11     |
|                            | 80                 | 4      | 32     | 81                  | 6      | 31     | 84                   | 10     | 14     |
|                            | 82                 | 24     | 17     | 82                  | 16     | 5      | 86                   | 10     | 9      |
|                            | 92                 | 11     | 32     | 91                  | 12     | 16     | 88                   | 10     | 17     |
|                            | 98                 | 3      | 32     | 93                  | 3      | 32     | 94                   | 10     | 22     |
|                            | 98                 | 4      | 32     | 97                  | 5      | 17     | 95                   | 10     | 23     |
| Means.....                 | 83.5               | 12     | 29.4   | 82                  | 7.4    | 19.5   | 83.6                 | 10     | 15.3   |
| Stand. Error               | 9.6                | 7.7    | 4.6    | 8.5                 | 4.0    | 9.9    | 7.6                  |        | 4.8    |
| Stand. Error<br>of Means.. | 3.2                | 2.5    | 1.5    | 2.8                 | 1.3    | 3.3    | 2.5                  |        | 1.6    |

The standard error of difference of Means in the case of I.Q.'s shows that the three groups are not significantly different. These standard errors of differences are as follows:

Standard error of difference of Mean A and Mean B, 4.2. Difference, .7

Standard error of difference of Mean A and Mean C, 4.0. Difference, .1

Standard error of difference of Mean B and Mean C, 3.7. Difference, .8

The above refer to differences of intelligence and in no case is this difference large enough to be considered significant.

A summary of Table XXVIII shows that there is a difference in the time taken to learn the same material with the different



attitudes of work. Also, there is a difference in the value of the generalization at a future time with difference of attitude at the time of learning. Method I takes longer than Method II. Since the number of trials was arbitrary in the case of Method III, this method might have used fewer trials. The first method, which takes a little longer in the case of those learning than does the second method, has greater functional value at a later time. Table XXIX summarizes the previous table and brings out these facts.

TABLE XXIX

| Material I (Population of 27 subjects, three equal groups of 9 each)      |                       |                       |                       |
|---|-----------------------|-----------------------|-----------------------|
|   | Method I (Group A)    | Method II (Group B)   | Method III (Group C)  |
| I.Q. A  | 83.5                  | 82.0                  | 83.6                  |
| Learning<br>(M. of trials)  | 12.0                  | 7.4                   | 10 (arbitrary)        |
| Recall  | 29.4 (91.9 per cent.) | 19.5 (60.9 per cent.) | 15.3 (47.8 per cent.) |
| Functional value 3<br>days later with new<br>material of similar<br>type. |                       |                       |                       |

(Recall score is on basis of 32 as perfect,  
or 100 per cent. recall.)

The standard error of difference of Mean A and Mean B in the case of the learning score is 2.8 trials. The difference is 4.6. This is possibly a significant difference.

The standard errors of the differences in relation to the differences in the case of the recall scores are such as to indicate a significant difference in each case. These standard errors are as follows:

|  |        |                   |
|--|--------|-------------------|
| Standard error of difference Mean A Mean B | = 3.6. | Difference = 9.9  |
| Standard error of difference Mean A Mean C | = 2.3. | Difference = 14.1 |
| Standard error of difference Mean B Mean C | = 3.6. | Difference = 4.2  |

The same differences are indicated with Material II as with Material I with different attitudes of work. The number of cases learning this more difficult material is smaller, which makes the results less regular and also less valid. Nevertheless the same general tendency is indicated.

Table XXX gives details of response for the three groups to Material II.

A summary of Table XXX shows that no difference is indicated in time taken to learn with Methods I and II. The mean of trials taken for these two methods is the same. There seems to be indicated some difference in the value of the concepts at a later date, depending upon the attitude at the time of learning. The number of cases is small, which makes the standard errors large. These differences do not show the statistical validity of differences

given with Method I, but since they lie in the same direction, it is safe to assume that an increase in number of cases might verify the differences indicated.

Table XXXI summarizes the facts brought out in Table XXX and points out the differences mentioned.

TABLE XXX

## Material II

Three groups of equal mentality who learned with different instructions

|                             | Method I (Group B) |        |        | Method II (Group C) |        |        | Method III (Group A) |        |        |
|-----------------------------|--------------------|--------|--------|---------------------|--------|--------|----------------------|--------|--------|
|                             | I.Q.               | Learn. | Recall | I.Q.                | Learn. | Recall | I.Q.                 | Learn. | Recall |
|                             |                    | Trials | Score  |                     | Trials | Score  |                      | Trials | Score  |
|                             | 66                 | 9      | 32     | 62                  | 10     | 18     | 68                   | 10     | 21     |
|                             | 76                 | 7      | 32     | 78                  | 14     | 12     | 77                   | 10     | 24     |
|                             | 81                 | 19     | 20     | 82                  | 14     | 5      | 82                   | 10     | 14     |
|                             | 82                 | 20     | 5      | 84                  | 10     | 23     | 82                   | 10     | 32     |
|                             | 85                 | 8      | 18     | 86                  | 12     | 7      | 88                   | 10     | 17     |
|                             | 93                 | 8      | 32     | 94                  | 11     | 20     | 92                   | 10     | 16     |
| Means.....                  | 80.5               | 11.8   | 23.1   | 81                  | 11.8   | 14.1   | 81.5                 | 10     | 20.6   |
| Stand. Error                | 8.2                | 5.2    | 10.0   | 9.7                 | 4.1    | 6.6    | 7.6                  |        | 2.2    |
| Stand. Errors<br>of Means.. | 3.4                | 2.1    | 4.0    | 4.0                 | 1.7    | 2.7    | 3.1                  |        | .91    |

The standard errors of the differences of Means in the case of I.Q.'s shows that the differences are not significant. These standard errors of differences are as follows:

Standard error of difference of Mean B and Mean C = 5.2. Difference = .5  
 Standard error of difference of Mean B and Mean A = 4.6. Difference = 1.0  
 Standard error of difference of Mean C and Mean A = 5.0. Difference = .5

None of these differences are significant if the Mean of Groups is the basis of comparison.

TABLE XXXI

(Abbreviation of Table XXVII)

(Showing time taken and functional value later in the case of subjects working with difference in instructions)

Material II (Population of 18 subjects, three equal groups of 6 each)

|                            | Method I (Group B)  | Method II (Group C)   | Method III (Group A)  |
|----------------------------|---------------------|-----------------------|-----------------------|
| I.Q.                       | 80.5                | 81.0                  | 81.5                  |
| Learning<br>(M. of trials) | 11.8                | 11.8                  | 10.0                  |
| Recall                     | 23.1 (72 per cent.) | 14.1 (43.7 per cent.) | 20.6 (62.1 per cent.) |

The standard errors of differences of means in the case of recall scores are not such as to prove statistically that these differences are significant. Significance is indicated in 2 cases. These standard errors of differences of Means are as follows:

Standard error of difference of Mean B Mean C = 4.8. Difference = 9.0  
 Standard error of difference of Mean B Mean A = 4.1. Difference = 2.5  
 Standard error of difference of Mean C Mean A = 2.9. Difference = 6.5

(This last difference seems significant and seems to indicate a preference for Method III over Method II for this Material as far as recall value is concerned.)



The results presented both with Material I and Material II seem to show that, where learning occurs, it is more valuable at a later time if the subject worked with Method I instruction than if Method II or III were used. Some difference is indicated in favor of Method II over Method III with the simpler material, but this did not hold true with the particular difficulty of Material II. With this material (II) Method III seemed superior to II for recall.

(4) Qualitative differences in the process of learning with difference of attitude during the learning period.

Differences with the same instruction: With the first instruction (Method I) different attitudes were assumed by the learners. These differences were observable in the learning curves of those subjects who learned in the time allowed, and of those who did not learn. The curves of scores on successive trials and of percentage values for different positions in the series bring out these

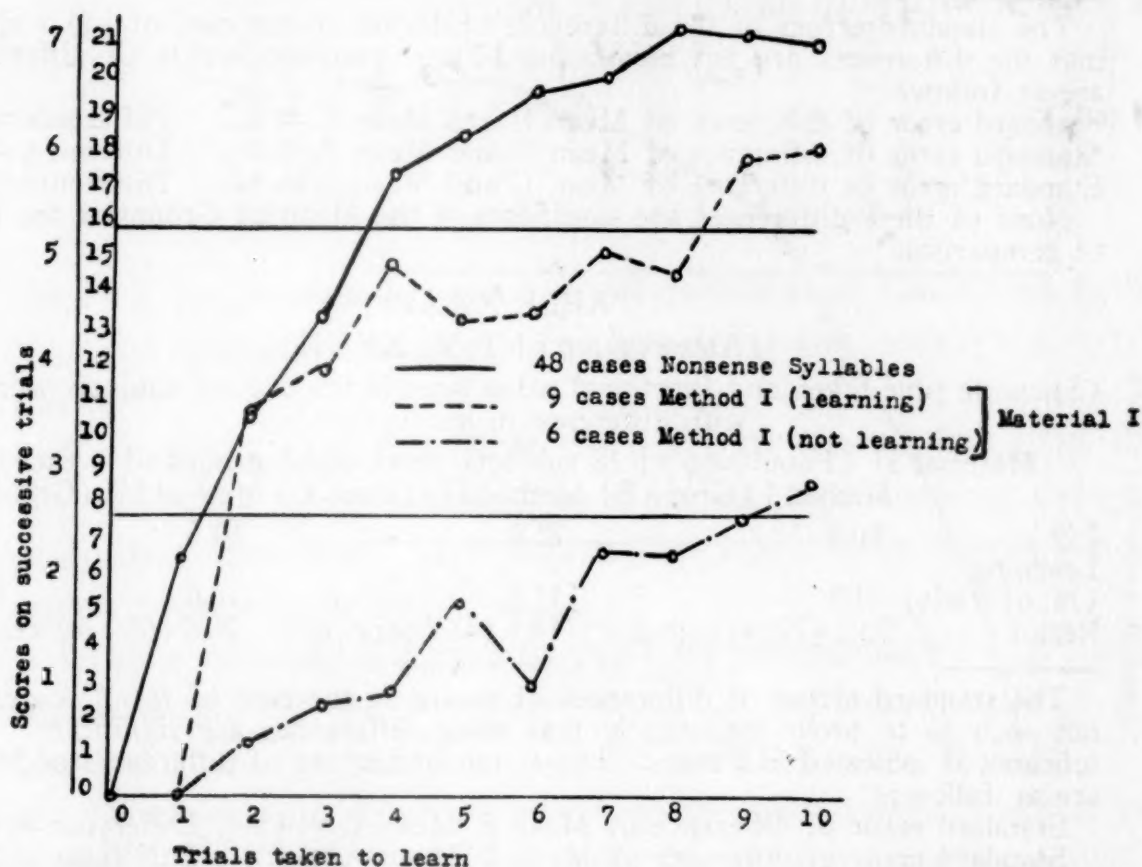


FIG. 26. Whittier Group: Material I. Comparison of those learning and those not learning with Method I attitude. Chart includes also a comparison with the response of learning Nonsense Syllable series of the same length.

TABLE XXXII

Scores on successive trials for two groups of subjects working with the same instruction, one group learning and the other group not learning

|                                    | Trials | Mean Scores |      |      |      |      |      |      |      |      |    |
|------------------------------------|--------|-------------|------|------|------|------|------|------|------|------|----|
|                                    |        | 1           | 2    | 3    | 4    | 5    | 6    | 7    | 8    | 9    | 10 |
| Mat. I (9 cases learning).....     | 0      | 3.6         | 4.0  | 5.0  | 4.5  | 4.6  | 5.3  | 4.9  | 6.0  | 6.2  |    |
| Mat. I (6 cases not learning) ..   | 0      | .5          | .8   | 1.0  | 1.8  | 1.1  | 2.3  | 2.3  | 2.6  | 2.9  |    |
| Mat. II (6 cases learning).....    | 0      | 2.0         | 1.5  | 2.5  | 3.3  | 3.4  | 4.3  | 6.5  | 7.3  | 6.8  |    |
| Mat. II (12 cases not learning) .. | 0      | 1.5         | 1.6  | 1.6  | 1.6  | 1.7  | 1.9  | 2.0  | 2.5  | 2.2  |    |
| Nonsense (48 cases) Syllables..    | 6.6    | 10.8        | 13.5 | 17.5 | 18.6 | 19.9 | 20.3 | 21.7 | 21.5 | 21.3 |    |

differences very clearly. They also indicate the differences between the process present in these cases and in the ordinary memory curves for nonsense materials. The accompanying tables and charts (Tables XXXII and XXXIII, figures 26, 27, 28) give the detail of these differences. They show the following points:

1. A difference is observable from the beginning in the performance of the subjects who are going to learn and those subjects who are not going to learn. This difference is of the nature of a depression of the score of those not learning. This difference is present with both difficulties of material.

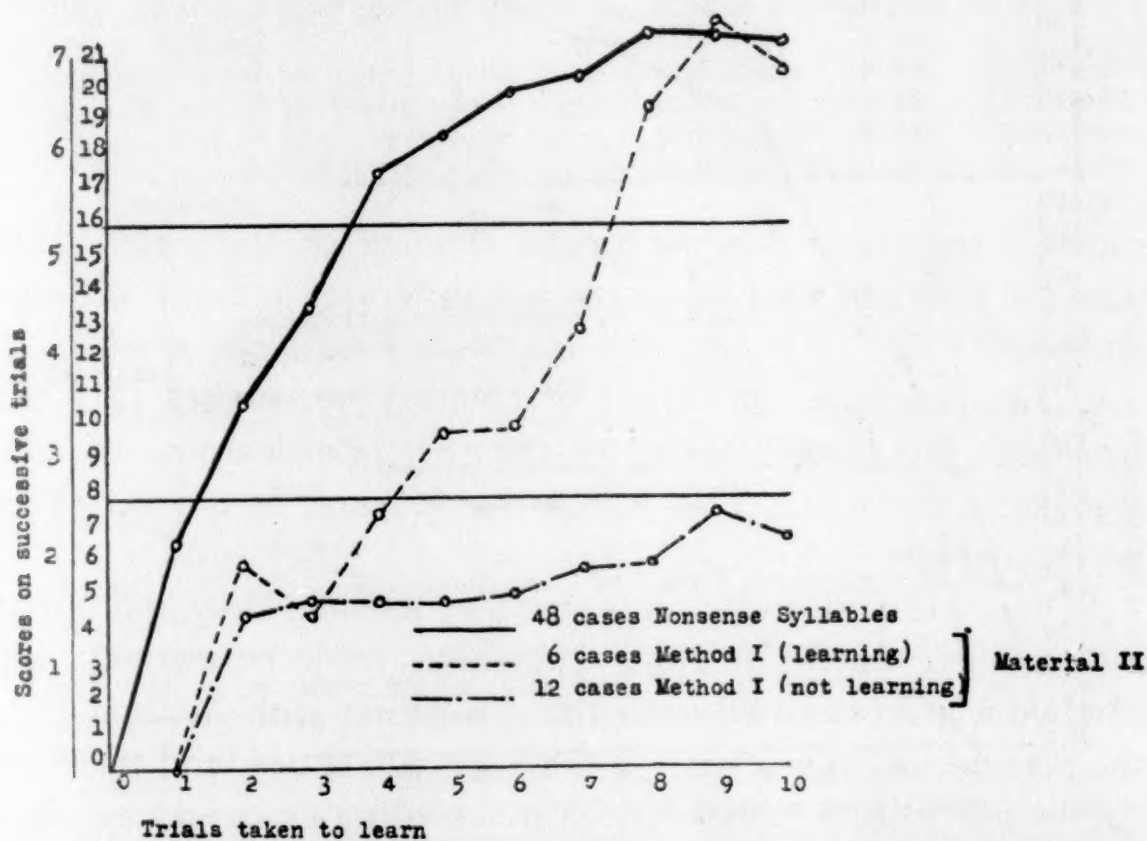


FIG. 27. Whittier Group: Material II. Comparison of those learning and those not learning with Method I instruction. Comparison of this process with that for learning Nonsense Syllables.



2. The irregularity is greater in each case in the group that learns. The group that does not learn more nearly approaches the group learning a purely nonsense memory series.

3. A very noticeable difference is shown in the development of associations for different positions in the series with the two groups. The curve for position preference with those subjects not learning is almost identical in form with the memory curve for the same fact. This likeness is a likeness of form of curves. The curve for those not learning shows a preference in learning for the first and last positions in the series which is characteristic also of the memory process. The curve for those who do learn

TABLE XXXIII

Percentage Values of Positions in a series for groups working with the same instruction, one group learning and the other group not learning. Also percentage values of these same positions in a purely memory series.

| Position<br>in<br>Series | Material I<br>Method I<br>9 Cases | Material I<br>Method II<br>6 Cases | Material II<br>Method I<br>6 Cases | Material II<br>Method II<br>12 Cases | Memory<br>39 Cases |
|--------------------------|-----------------------------------|------------------------------------|------------------------------------|--------------------------------------|--------------------|
|                          | Learning                          | Not Learning                       | Learning                           | Not Learning                         |                    |
| 1                        | 62.4                              | 50.6                               | 62.9                               | 56.6                                 | 89.3               |
| 2                        | 75.0                              | 42.6                               | 63.0                               | 35.6                                 | 68.0               |
| 3                        | 63.9                              | 26.6                               | 60.9                               | 25.0                                 | 58.0               |
| 4                        | 46.8                              | 13.3                               | 55.4                               | 47.6                                 | 76.5               |
| 5                        | 64.4                              | 21.3                               | 46.0                               | 19.6                                 | 57.3               |
| 6                        | 74.6                              | 38.6                               | 44.2                               | 17.0                                 | 55.1               |
| 7                        | 61.7                              | 30.0                               | 48.2                               | 25.0                                 | 77.5               |
| 8                        | 72.6                              | 46.6                               | 38.4                               | 37.3                                 | 78.7               |

shows a preference for the second member of the series rather than the first and a tendency for less difference between different positions.

4. In every case the curve for memory lies higher than that for either the group learning or the group not learning the generalization material. This means that learning is quicker in the purely memory process.

Differences with the various attitudes stimulated by appropriate instructions: If the learning curves of subjects working with Method I are compared with those working with Method II on the generalization material of different difficulties, and these two curves are in turn compared with the memory curves resulting from like groups learning a purely nonsense series, such comparisons demonstrate qualitative differences in the learning process.

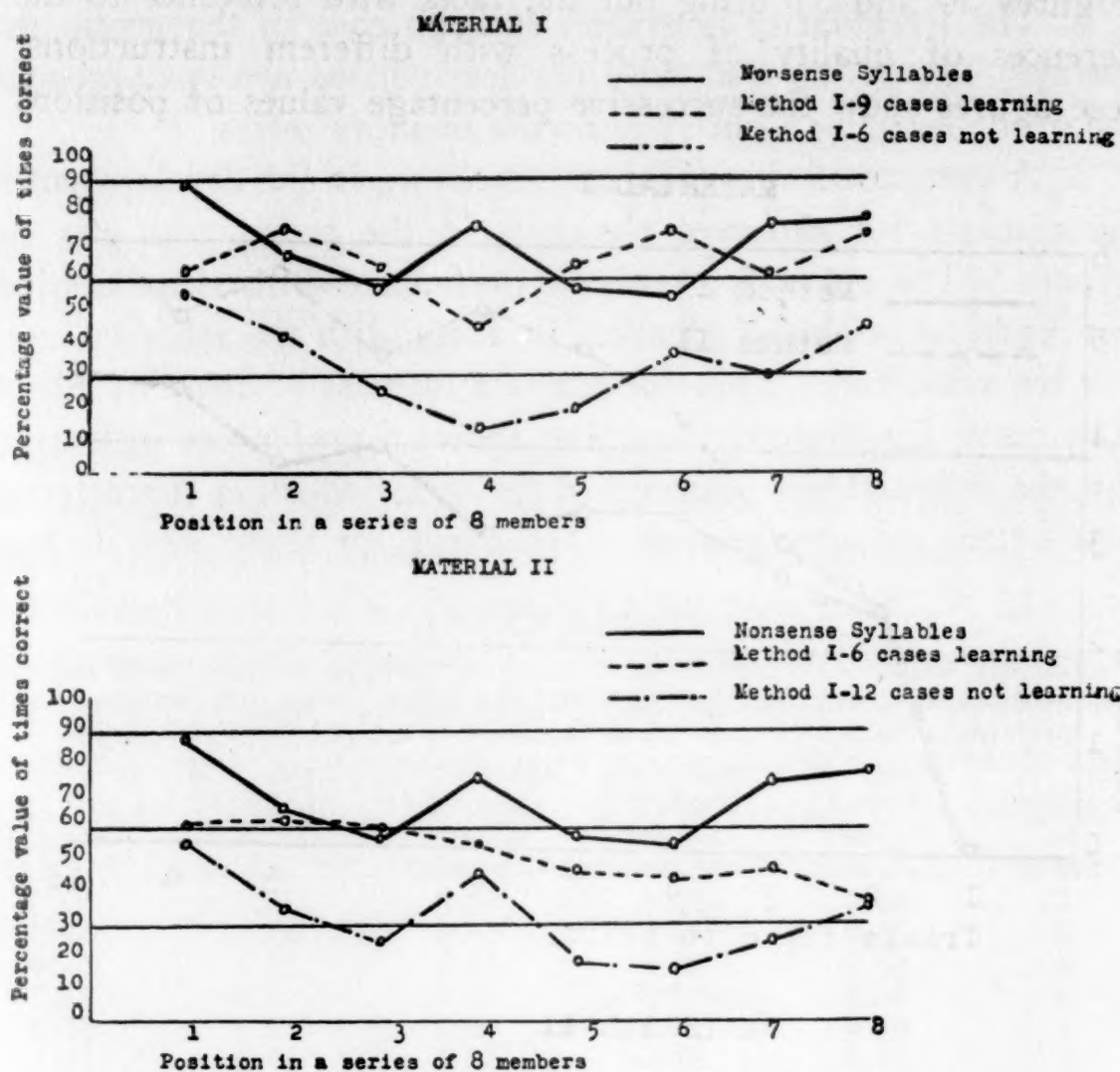


FIG. 28. Whittier Group: Comparison of those learning and those not learning with Method I attitude. Also comparison with memory process for Nonsense Syllables.

Table XXXIV and figure 29 show these differences. These again are differences in the regularity and height of the learning curves which represent scores on successive trials and also differences in the curves of percentage values of different positions in the series. These later show the position preference change with change of process.

TABLE XXXIV  
Scores on successive trials with different processes

| Trials                              | Scores |     |     |     |     |     |     |     |     |     |
|-------------------------------------|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                                     | 1      | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  |
| Mat. I—Meth. I (15 cases) . . . .   | 0      | 2.4 | 2.7 | 3.4 | 3.4 | 3.2 | 4.1 | 3.8 | 4.6 | 4.8 |
| Mat. I—Meth. II (18 cases) . . . .  | 0      | 2.4 | 3.1 | 4.3 | 5.0 | 5.4 | 4.9 | 5.7 | 5.3 | 6.4 |
| Mat. II—Meth. I (18 cases) . . . .  | 0      | 1.7 | 1.6 | 1.9 | 2.2 | 2.3 | 2.7 | 3.5 | 4.1 | 3.7 |
| Mat. II—Meth. II (15 cases) . . . . | 0      | 1.8 | 1.8 | 2.2 | 2.4 | 2.7 | 2.7 | 2.6 | 3.0 | 4.2 |



Figures 30 and 31 bring out the facts with reference to the differences of quality of process with different instructions. These figures show the successive percentage values of positions

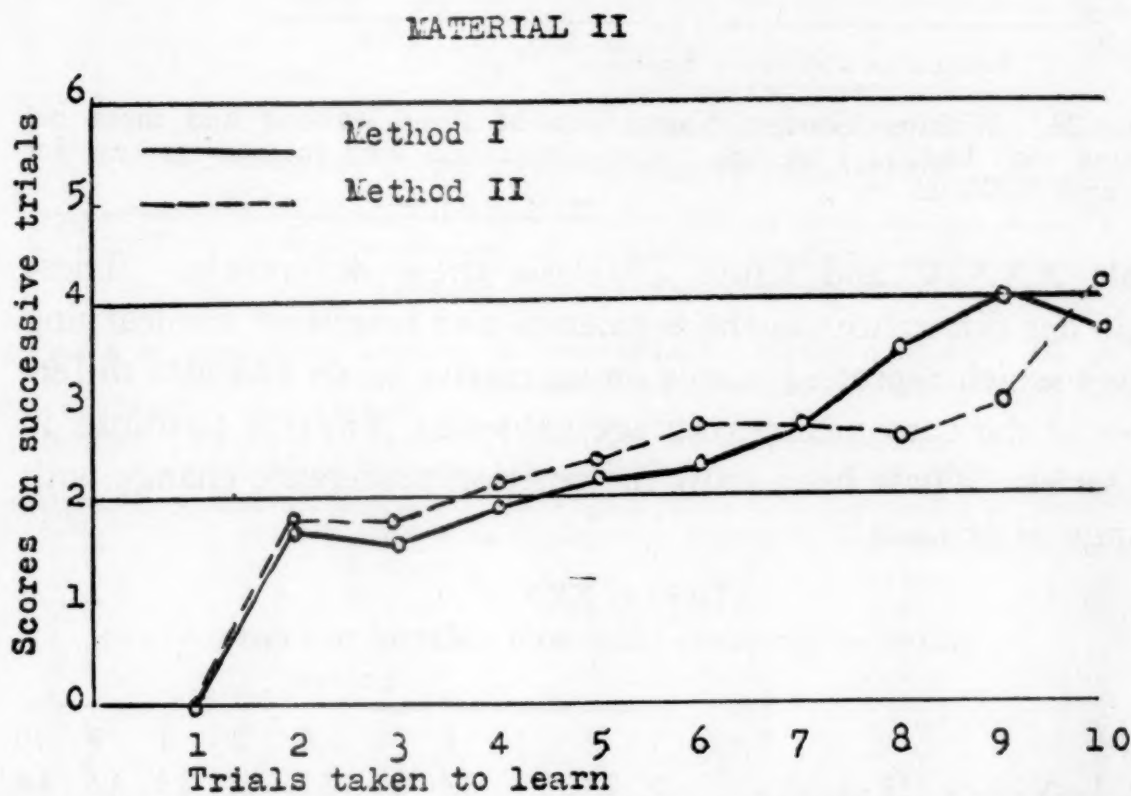
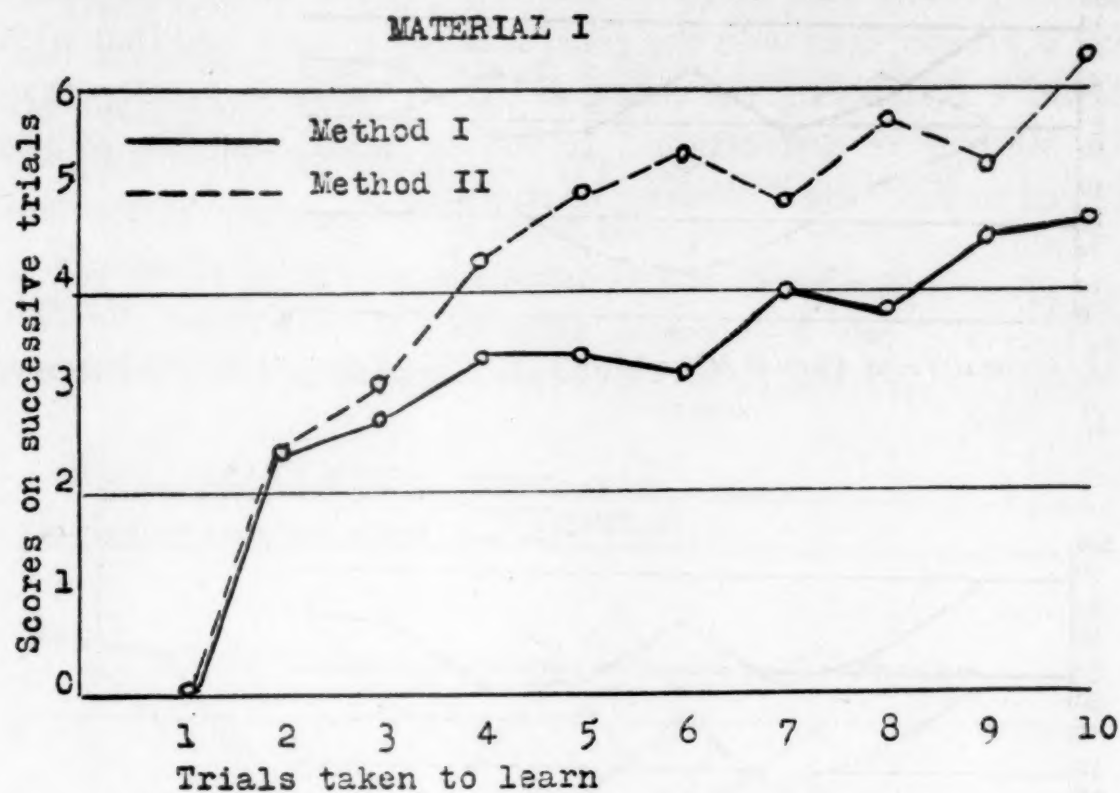


FIG. 29. Whittier Group: Comparison of learning curves with Methods I and II.

in a learning series with different processes and also show the deviations of the successive values from the mean percentage value for all 8 positions. The point of interest here is that with the memory process this mean deviation from the mean percentage value is greater than with the generalization process and that with Method I instruction the mean deviation value is greater than with Method II instruction. It will be noted that the values referred to have the following relationship:

#### Material I.

Method I, M.D., 7.32; Method II, M.D., 4.68; Memory, M.D., 9.07.

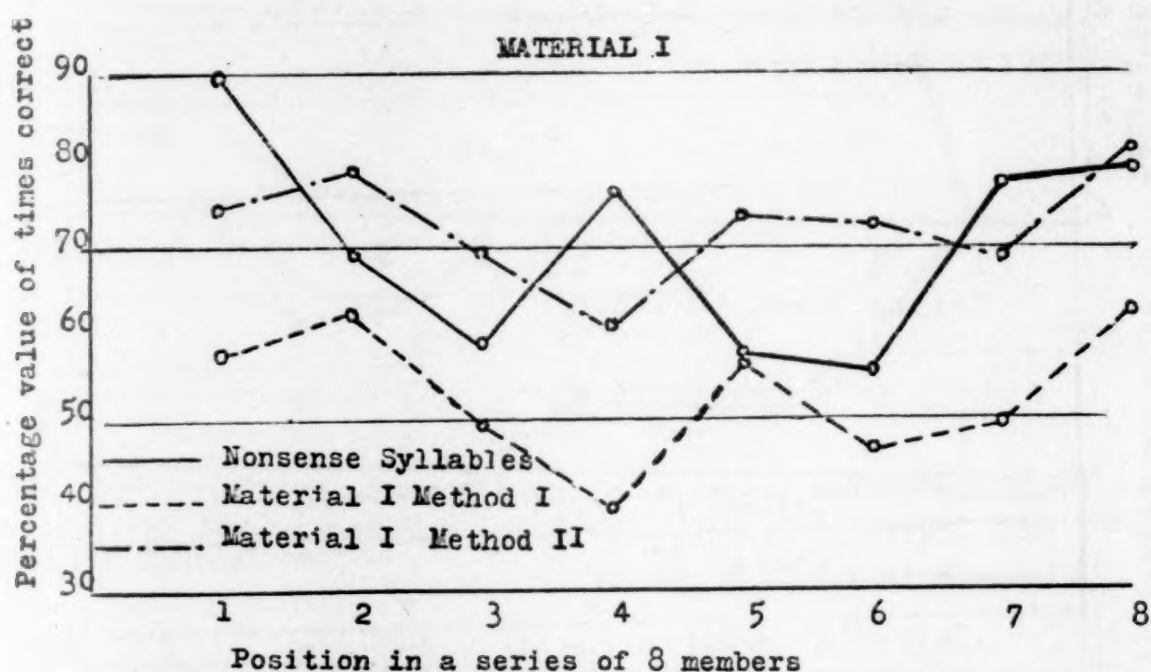


FIG. 30. Whittier Group: Comparison of position preference in a series with Methods I and II and with the Memory Process.

| Position | Nonsense Syllables<br>(48 cases) |           | Material I, Method I<br>(15 cases) |           | Material I, Method II<br>(18 cases) |           |
|----------|----------------------------------|-----------|------------------------------------|-----------|-------------------------------------|-----------|
|          | Percentage                       | Deviation | Percentage                         | Deviation | Percentage                          | Deviation |
| 1.....   | 89.3                             | 19.23     | 57.7                               | 4.3       | 74.3                                | 2.2       |
| 2.....   | 68.0                             | 1.05      | 62.1                               | 8.7       | 78.3                                | 6.2       |
| 3.....   | 58.0                             | 2.05      | 49.0                               | 4.4       | 69.1                                | 3.0       |
| 4.....   | 76.5                             | 6.45      | 39.0                               | 14.0      | 60.8                                | 11.3      |
| 5.....   | 57.3                             | 12.75     | 61.1                               | 7.7       | 73.9                                | 1.8       |
| 6.....   | 55.1                             | 14.95     | 46.9                               | 6.5       | 72.3                                | .2        |
| 7.....   | 77.5                             | 7.45      | 49.2                               | 4.2       | 67.2                                | 4.9       |
| 8.....   | 78.7                             | 8.65      | 62.2                               | 8.8       | 81.1                                | 9.3       |

Mean 70.0 M. D. 9.07    M. 53.4 M. D. 7.32    M. 72.1 M.D. 4.68



## Material II.

Method I, M.D., 9.62; Method II, M.D., 6.95; Memory, M.D., 9.07.

These data indicate that Method II includes less of memory and association for particular syllables out of their relation to the total generalization. They also indicate that with the more complex material (Material II) the process with Method I instruction stimulates little other than pure memory.

Figure 31 brings out the same fact with reference to the more difficult material. While with Material I the generalization process gives the second syllable more value, with Material II

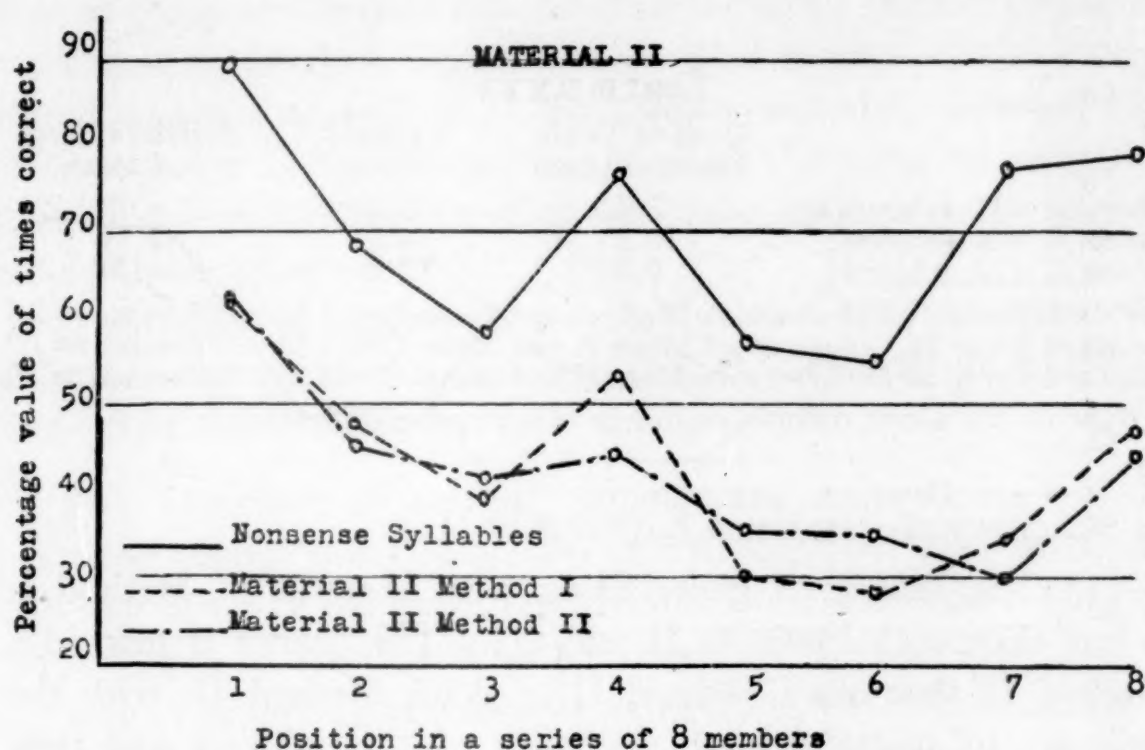


FIG. 31. Whittier Group: Comparison of position preference in a series with Methods I and II and the Memory Process.

| Position | Nonsense Syllables<br>(48 cases) |           | Material II, Method I<br>(17 cases) |           | Material II, Method II<br>(15 cases) |           |
|----------|----------------------------------|-----------|-------------------------------------|-----------|--------------------------------------|-----------|
|          | Percentage                       | Deviation | Percentage                          | Deviation | Percentage                           | Deviation |
| 1.....   | 89.3                             | 19.25     | 61.8                                | 19.2      | 61.9                                 | 19.6      |
| 2.....   | 68.0                             | 1.05      | 47.3                                | 4.7       | 45.8                                 | 3.5       |
| 3.....   | 58.0                             | 2.05      | 39.1                                | 3.5       | 41.7                                 | .6        |
| 4.....   | 76.5                             | 6.45      | 53.2                                | 10.6      | 44.7                                 | 2.4       |
| 5.....   | 57.3                             | 12.75     | 30.1                                | 12.5      | 35.3                                 | 7.0       |
| 6.....   | 55.1                             | 14.95     | 28.3                                | 14.3      | 35.0                                 | 7.3       |
| 7.....   | 77.5                             | 7.45      | 34.6                                | 8.0       | 20.0                                 | 12.3      |
| 8.....   | 78.7                             | 8.65      | 46.8                                | 4.2       | 44.7                                 | 2.4       |

Mean 70.05M. D. 9.07    M. 42.6 M. D. 9.62    M. 42.3M.D. 6.95

the difficulty causes the process to approach more nearly the memory curve.

- (5) Relation of differences in learning with different instructions to observed differences in the memory of groups learning.

The three groups used in the comparisons of effect of attitude on learning may be considered equated in memory as well as intelligence and chronological age. This is true of the groups if learning of nonsense syllable series can be used as measuring the memory factor in learning. Table XXXV summarizes the comparison of groups A, B, and C.

TABLE XXXV

|  | Mean of Trials<br>Taken to Learn | Standard<br>Error | Standard Error<br>of Mean |
|--|----------------------------------|-------------------|---------------------------|
| Group A (15 subjects)  | 7.6                              | 3.0               | .78                       |
| Group B (18 subjects)  | 10.2                             | 4.7               | 1.11                      |
| Group C (15 subjects)  | 9.29                             | 3.0               | .78                       |
| Standard Error of Difference of Mean A and Mean B = 1.35. Difference = 2.6 |                                  |                   |                           |
| Standard Error of Difference of Mean A and Mean C = 1.10. Difference = 1.7 |                                  |                   |                           |
| Standard Error of Difference of Mean B and Mean C = 1.35. Difference = .9  |                                  |                   |                           |

None of the above differences can be considered significant.

#### f. Summary of Results of Experiment II.

(1) The chance of generalizing with Material I, Method I, is less than with Methods II and III. The chance is less with Method II than with Method III. With Method II, with the difficulty of material used, mentality of the subjects and time limits set by this experiment, generalization occurred in 100 per cent of the cases.

(2) The chance of generalizing with more difficult material (Material II) is least with Method I and greatest with Method III. The chief difference between the chance with more difficult and less difficult material is that the per cent of subjects learning is less in the case of the more difficult material with Methods I and II.

(3) There is a high degree of relationship between the chance of generalizing with either Method I or Method II and the degree



of intelligence of the subject. This relationship is brought out with different difficulties of materials used.

(4) With this low mentality group, there is a difference in the time taken to generalize with difference of instruction. Method I takes longer than Method II. Since the number of trials for Method III was arbitrarily determined, the time taken with this method is not necessarily the minimum time. Therefore no comparison of time taken with Method III is allowed with the present technique of measurement.

(5) Considering separately those subjects who succeed in generalizing in the time given, the writer finds that the functional value of the generalization measured by the recall score is greatest in the case of Method I instruction. This is true of the more difficult material as well as of the simpler material. Method II seems superior in this respect to Method III with the simpler material, but this difference does not show itself with the more complex material.

(6) Qualitative differences are observable in the processes of subjects working with the same material but with different instructions. The differences observable are as follows:

(a) The curve of learning, using scores on successive trials, is more regular with Method I instruction than with Method II. In this way the curve for Method I resembles the memory curve more nearly than does the curve for Method II.

(b) A difference in the order of development of associations with different instruction is evidenced by the curve of preference in learning for different positions in a series. With the memory process the first and last syllables show a preference over the middle members of the series, with some preference for some one middle member. With the generalization process there is a tendency for the second member to gain greater value for recall and for the differences between different positions to be lessened in importance.

✓(c) The difference of order of development of associations allows for the observation of the mean deviation value from the mean percentage value of the different positions in the series ✓

being learned. This value proves greater in the case of the memory process than in the case of the generalization process. Method I stands between the memory process and Method II in this respect. This value is a measure of generalization occurring in the process or of tendency to ignore incidental associations in favor of more general elements.

(7) Differences observed with difference of instruction are not accounted for by differences in memory ability of subjects used.

(8) With this low mentality group the same differences obtain with difference of attitude of work as were shown to obtain with children with a wider range of mentality including much higher levels of intelligence.

#### D. Experiment III with Adults

##### a. Problem.

The problem in this experiment was the same as in the two preceding experiments with the addition of the problem of discovering how the attitudes would function with different degrees of complexity of situation or material with adult subjects. The same variations of instruction were given to control the attitudes and the identical procedure used as in the preceding experiments.

##### b. Materials.

The materials used for this experiment were Materials I, II, and III of the generalization material described earlier in this report (pp. 27-37). The nonsense syllable series I described before (p. 38), arranged in booklet form (p. 38) was used. For this group the Thorndike Intelligence Examination for High School Graduates (175) was used for equating groups used in intelligence.

##### c. Subjects.

This group consisted originally of 30 subjects. These 30 subjects were students in psychology classes. Each member of this group was of senior or graduate standing and had had two or more quarters of work in general or experimental psychology or



both. Due to the unavoidable absence of the experimenter for two weeks at the end of this period, the work completed included only 17 subjects, 9 men and 8 women. In spite of this irregularity, the results seem to the writer to present enough facts of interest to justify their inclusion here.

The mean of scores for this group on the Thorndike Intelligence Examination was 79.4, the standard deviation 13.6, and the range from 55.9 to 105.7. The chronological ages ranged from 18 to 21 years.

The same method of arranging groups of equal mentality as used with children and Whittier group was used with the adult group (p. 48).

Final arrangement of three groups of equal mentality. Table XXXVI shows the subjects completing this experiment. All the original 30 subjects did not complete this experiment; therefore this small group contains great irregularity.

TABLE XXXVI

| Group A   |  | Thorndike Score | Sex |
|---|--|-----------------|-----|
| No.   |  |                 |     |
| 1.....  |  | 55.9            | F   |
| 2.....  |  | 70.7            | M   |
| 3.....  |  | 77.6            | F   |
| 4.....  |  | 81.9            | M   |
| 5.....  |  | 89.7            | M   |
| 6.....  |  | 105.7           | M   |
| Mean, 80.2.    Standard Error, 15.4.    Standard Error of Mean, 6.2.  |  |                 |     |
| Group B   |  | Thorndike Score | Sex |
| No.   |  |                 |     |
| 1.....  |  | 64.5            | F   |
| 2.....  |  | 73.8            | M   |
| 3.....  |  | 75.0            | M   |
| 4.....  |  | 89.1            | M   |
| 5.....  |  | 99.8            | F   |
| Mean, 80.4.    Standard Error, 12.47.    Standard Error of Mean, 5.5. |  |                 |     |
| Group C   |  | Thorndike Score | Sex |
| No.   |  |                 |     |
| 1.....  |  | 62.2            | M   |
| 2.....  |  | 62.3            | F   |
| 3.....  |  | 74.3            | F   |
| 4.....  |  | 85.7            | F   |
| 5.....  |  | 86.3            | M   |
| 6.....  |  | 95.8            | F   |
| Mean, 77.7.    Standard Error, 12.6.    Standard Error of Mean, 5.1.  |  |                 |     |

These groups are not significantly different in intellectual status, age, or sex. The following indicate standard errors of differences of means of intelligence scores.

being learned. This value proves greater in the case of the memory process than in the case of the generalization process. Method I stands between the memory process and Method II in this respect. This value is a measure of generalization occurring in the process or of tendency to ignore incidental associations in favor of more general elements.

(7) Differences observed with difference of instruction are not accounted for by differences in memory ability of subjects used.

(8) With this low mentality group the same differences obtain with difference of attitude of work as were shown to obtain with children with a wider range of mentality including much higher levels of intelligence.

#### D. Experiment III with Adults

##### a. Problem.

The problem in this experiment was the same as in the two preceding experiments with the addition of the problem of discovering how the attitudes would function with different degrees of complexity of situation or material with adult subjects. The same variations of instruction were given to control the attitudes and the identical procedure used as in the preceding experiments.

##### b. Materials.

The materials used for this experiment were Materials I, II, and III of the generalization material described earlier in this report (pp. 27-37). The nonsense syllable series I described before (p. 38), arranged in booklet form (p. 38) was used. For this group the Thorndike Intelligence Examination for High School Graduates (175) was used for equating groups used in intelligence.

##### c. Subjects.

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both. Due to the unavoidable absence of the experimenter for two weeks at the end of this period, the work completed included only 17 subjects, 9 men and 8 women. In spite of this irregularity, the results seem to the writer to present enough facts of interest to justify their inclusion here.

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The same method of arranging groups of equal mentality as used with children and Whittier group was used with the adult group (p. 48).

Final arrangement of three groups of equal mentality. Table XXXVI shows the subjects completing this experiment. All the original 30 subjects did not complete this experiment; therefore this small group contains great irregularity.

TABLE XXXVI

| Group A   |  | Thorndike Score | Sex |
|---|--|-----------------|-----|
| No.   |  |                 |     |
| 1.....  |  | 55.9            | F   |
| 2.....  |  | 70.7            | M   |
| 3.....  |  | 77.6            | F   |
| 4.....  |  | 81.9            | M   |
| 5.....  |  | 89.7            | M   |
| 6.....  |  | 105.7           | M   |
| Mean, 80.2.    Standard Error, 15.4.    Standard Error of Mean, 6.2.  |  |                 |     |
| Group B   |  | Thorndike Score | Sex |
| No.   |  |                 |     |
| 1.....  |  | 64.5            | F   |
| 2.....  |  | 73.8            | M   |
| 3.....  |  | 75.0            | M   |
| 4.....  |  | 89.1            | M   |
| 5.....  |  | 99.8            | F   |
| Mean, 80.4.    Standard Error, 12.47.    Standard Error of Mean, 5.5. |  |                 |     |
| Group C   |  | Thorndike Score | Sex |
| No.   |  |                 |     |
| 1.....  |  | 62.2            | M   |
| 2.....  |  | 62.3            | F   |
| 3.....  |  | 74.3            | F   |
| 4.....  |  | 85.7            | F   |
| 5.....  |  | 86.3            | M   |
| 6.....  |  | 95.8            | F   |
| Mean, 77.7.    Standard Error, 12.6.    Standard Error of Mean, 5.1.  |  |                 |     |

These groups are not significantly different in intellectual status, age, or sex. The following indicate standard errors of differences of means of intelligence scores.

Standard Error of Difference Mean A and Mean B = 8.2. Difference = .2  
 Standard Error of Difference Mean A and Mean C = 8.0. Difference = 2.5  
 Standard Error of Difference Mean B and Mean C = 7.5. Difference = 2.7

These differences are not significant, since in no case is the difference even as large as the standard error of the difference.

d. Procedure in this experiment.

The same procedure was used in equating the groups to be used as in the two preceding experiments. Chronological age was not equated, but the range was narrow, including only ages 18 to 21. The Thorndike score, rather than the intelligence quotient and mental age, was used to equate these groups in intelligence. The finally arranged groups are small.

These three groups of subjects learned three sets of generalization material: namely Material I, II, and III described before. Each group was given a different instruction with each set of material learned. The instructions outlined in Experiment I were used with these groups. Each set of materials learned was learned on a different day. Table XXXVII outlines the materials learned by the three groups and the order of learning. Method I, II, and III are the same variations of instruction as used with the first two experimental groups.

TABLE XXXVII

Order of learning of different materials

|          |              |            |  |
|----------|--------------|------------|--|
| Group A. | Material I   | Method I   | (Learned at first experimental period<br>or as many periods as necessary.<br>75 trials set as time limit.) |
|          | Material II  | Method II  | At a later period.   |
|          | Material III | Method III | At a third period.   |
| Group B. | Material III | Method I   |  |
|          | Material I   | Method II  |  |
|          | Material II  | Method III |  |
| Group C. | Material II  | Method I   |  |
|          | Material III | Method II  |  |
|          | Material I   | Method III |  |

This order kept Method I first with every group. This was necessary, because, if previous material had been learned with a more definite instruction, it would have been impossible to get the attitude desired with Method I instruction later.



Method III was limited as follows: In each case 3 successive presentations of sets I and II of the material being learned with this instruction were given. The check required the naming of the first member of set III of the material.

The time and other details of presenting materials were identical with those in Experiments I and II with groups used there. Sets XV, XVI, XVII, and XVIII were used to check one week later on the functioning of the generalization that had been learned at the earlier period. The same series of nonsense syllables was used, and the methods of recording and treating results were the same as with the two previous groups.

e. Results of Experiment III, with Adults.

(1) Number learning with variations in attitude and different difficulties of material.

The results here show that with Method I the chance of all subjects learning in the time limit set is less than with either Method II or Method III, and that as the material becomes more difficult, the chance of learning with Method I becomes less. Table XXXVIII brings out these facts.

TABLE XXXVIII

Per cent of subjects generalizing in time limits with different attitudes and different difficulties of materials

|                 | Material I | Material II | Material III |
|-----------------|------------|-------------|--------------|
| Method I.....   | 100        | 66          | 40           |
| Method II.....  | 100        | 100         | 100          |
| Method III..... | 100        | 100         | 100          |

(2) Time taken to learn and efficiency of recall with variation in attitude and in difficulty of material.

The time taken to learn was in each case greatest with Method I, but recall with Method I was more complete. This difference is indicated in Table XXXIX.

Table XXXIX shows that the attitude which takes the longest and has with it less chance of learning has greatest value if completeness of recall is the aim. It shows also that with an increase in complexity of the material there is a great increase in the time taken to generalize with this attitude (Method I).

The number of cases is small in the above groups, which makes it impossible to accept as statistically valid the above differences but they are nevertheless significant since they lie in the same direction as the results with Experiments I and II which included a larger number of cases.

Table XL gives in detail the results of learning of the three groups summarized in the previous table.

TABLE XXXIX

Learning with different attitudes and different difficulties of material  
Time taken to learn

| Means of        | Material I<br>Trials | Material II<br>Trials | Material III<br>Trials |
|-----------------|----------------------|-----------------------|------------------------|
| Method I.....   | 7.0                  | 26.2                  | 37.0                   |
| Method II.....  | 6.8                  | 7.5                   | 17.2                   |
| Method III..... | 6.0                  | 6.0                   | 6.0                    |

Recall Score 1 week later (32-100 per cent)

|                 | Material I<br>Mean Score | Material II<br>Mean Score | Material III<br>Mean Score |
|-----------------|--------------------------|---------------------------|----------------------------|
| Method I.....   | 30.3                     | 31.0                      | 32.0                       |
| Method II.....  | 28.2                     | 28.5                      | 28.0                       |
| Method III..... | 20.4                     | 25.2                      | 26.6                       |

TABLE XL

Adult Group

## Group A

| No.   | Thorndike<br>Score | N. S. I. |    | Mat. I<br>Learn |      | Meth. I<br>Recall |       | Mat. II<br>Learn |      | Meth. II<br>Recall |       | Mat. III<br>Learn |      | Meth. III<br>Recall |       |
|-------|--------------------|----------|----|-----------------|------|-------------------|-------|------------------|------|--------------------|-------|-------------------|------|---------------------|-------|
|       |                    | L.       | R. | Tr.             | Ser. | Score             | Score | Tr.              | Ser. | Score              | Score | Tr.               | Ser. | Score               | Score |
| 1. F. | 55.9               | 8        | 2  | 12              | 2    | 23                |       | 7                | 2    | 29                 |       | 6                 | 2    | 29                  |       |
| 2. M. | 70.7               | 5        | 2  | 3               | 1    | 32                |       | 5                | 2    | 22                 |       | 6                 | 2    | 25                  |       |
| 3. F. | 77.6               | 5        | 1  | 8               | 1    | 32                |       | 11               | 2    | 30                 |       | 6                 | 2    | 29                  |       |
| 4. M. | 81.9               | 14       | 1  | 9               | 1    | 32                |       | 10               | 2    | 30                 |       | 6                 | 2    | 18                  |       |
| 5. M. | 89.5               | 4        | 3  | 5               | 1    | 32                |       | 8                | 2    | 28                 |       | 6                 | 2    | 31                  |       |
| 6. M. | 105.7              | 2        | 3  | 5               | 1    | 31                |       | 4                | 2    | 32                 |       | 6                 | 2    | 28                  |       |
|       | 481.3              | 38       | 12 | 42              | 7    | 182               |       | 45               | 12   | 171                |       | 36                | 12   | 160                 |       |
| M. s. | 80.2               | 6.3      | 2  | 7               | 1.1  | 30.3              |       | 7.5              | 2    | 28.5               |       | 6                 | 2    | 26.6                |       |

## Group B

| No.   | Thorndike<br>Score | N. S. I. |     | Mat. I<br>Learn |      | Meth. II<br>Recall |       | Mat. II<br>Learn |      | Meth. III<br>Recall |       | Mat. III<br>Learn |      | Meth. I<br>Recall |       |
|-------|--------------------|----------|-----|-----------------|------|--------------------|-------|------------------|------|---------------------|-------|-------------------|------|-------------------|-------|
|       |                    | L.       | R.  | Tr.             | Ser. | Score              | Score | Tr.              | Ser. | Score               | Score | Tr.               | Ser. | Score             | Score |
| 1. F. | 64.5               | 13       | 1   | 5               | 2    | 21                 |       | 6                | 2    | 20                  |       | 18                | 3    | 32                |       |
| 2. M. | 73.8               | 7        | 2   | 9               | 3    | 32                 |       | 6                | 2    | 31                  |       | 75—               | 7    | 0                 |       |
| 3. M. | 75.0               | 3        | 1   | 2               | 2    | 32                 |       | 6                | 2    | 30                  |       | 75—               | 7    | 0                 |       |
| 4. M. | 89.1               | 14       | 3   | 15              | 3    | 31                 |       | 6                | 2    | 20                  |       | 75—               | 7    | 0                 |       |
| 5. F. | 99.8               | 2        | 1   | 3               | 2    | 25                 |       | 6                | 2    | 25                  |       | 56                | 8    | 32                |       |
|       | 402.2              | 39       | 8   | 34              | 12   | 141                |       | 30               | 10   | 126                 |       | 74                | 11   | 64                |       |
| M. s. | 80.4               | 7.8      | 1.6 | 6.8             | 2.4  | 28.2               |       | 6                | 2    | 25.2                |       | 37                | 5.5  | 32                |       |



## Group C

| No.   | Thorndike<br>Score | N. S. I. |     | Mat. I<br>Learn |      | Meth. III<br>Recall<br>Score | Mat. II<br>Learn |      | Meth. I<br>Recall<br>Score | Mat. III<br>Learn |      | Meth. II<br>Recall<br>Score |
|-------|--------------------|----------|-----|-----------------|------|------------------------------|------------------|------|----------------------------|-------------------|------|-----------------------------|
|       |                    | L.       | R.  | Tr.             | Ser. |                              | Tr.              | Ser. |                            | Tr.               | Ser. |                             |
| 1. M. | 62.2               | 10       | 4   | ..              | ..   | ..                           | 31               | 3    | 32                         | ..                | ..   | ..                          |
| 2. F. | 62.3               | 7        | 1   | 6               | 2    | 11                           | 23               | 3    | 28                         | 8                 | 2    | 30                          |
| 3. F. | 74.3               | 3        | 1   | 6               | 2    | 12                           | 19               | 3    | 32                         | 30                | 3    | 30                          |
| 4. F. | 85.7               | ..       | ..  | 6               | 2    | 18                           | 75—              | 8    | 0                          | 10                | 2    | 28                          |
| 5. M. | 86.3               | 4        | 4   | 6               | 2    | 30                           | 32               | 2    | 32                         | 21                | 2    | 30                          |
| 6. F. | 95.8               | 5        | 2   | 6               | 2    | 31                           | 75—              | 7    | 0                          | 17                | 3    | 24                          |
| <hr/> |                    |          |     |                 |      |                              |                  |      |                            |                   |      |                             |
|       | 466.6              | 29       | 12  | 30              | 10   | 102                          | 105              | 11   | 124                        | 86                | 12   | 142                         |
| M. s. | 77.7               | 5.8      | 2.4 | 6               | 2    | 20.4                         | 26.2             | 2.7  | 31                         | 17.2              | 2.4  | 28.0                        |

## (3) Qualitative differences in process of learning with differences of attitude.

The accompanying figure shows that there is a different process in the case of subjects working with different instructions with the same materials. The quality of process is also modified by the relation of difficulty of the material to the subject generalizing.

Figure 32 shows the differences with Material I. This material is very easy for this group of subjects and is learned by most subjects in a very few trials. This chart makes a comparison of the process with Method I and that with Method II and shows the likeness and difference of these processes and the memory process when a series of nonsense syllables is being learned. With this difficulty of material there is not so great a resemblance between Method I and the memory process as with the more difficult material. The curve for Method I shows a preference ✓ for the second syllable over the first. This seems to the writer to indicate an attitude on the part of the observer to expect some generalization without instruction. With Method II, the first syllable has preference over the second. This means that with this simple material the generalization is discovered immediately if consciously looked for and the problem in successive trials is simply a memory problem of placing the names in mind with the proper symbols, for future recall.

Figure 32 shows the differences with Material II and Material III. This material was not easy enough for most of that group of subjects to get an immediate generalization. Therefore the results exhibit more nearly the same tendencies that were shown with the other groups with the simpler material. There is a

difference between the process when generalization material is being worked with and when the process is purely a memory process. With Material II, the process with Method I resembles the memory process more than does the process with Method II.

Table XLII presents the detail with reference to the charts

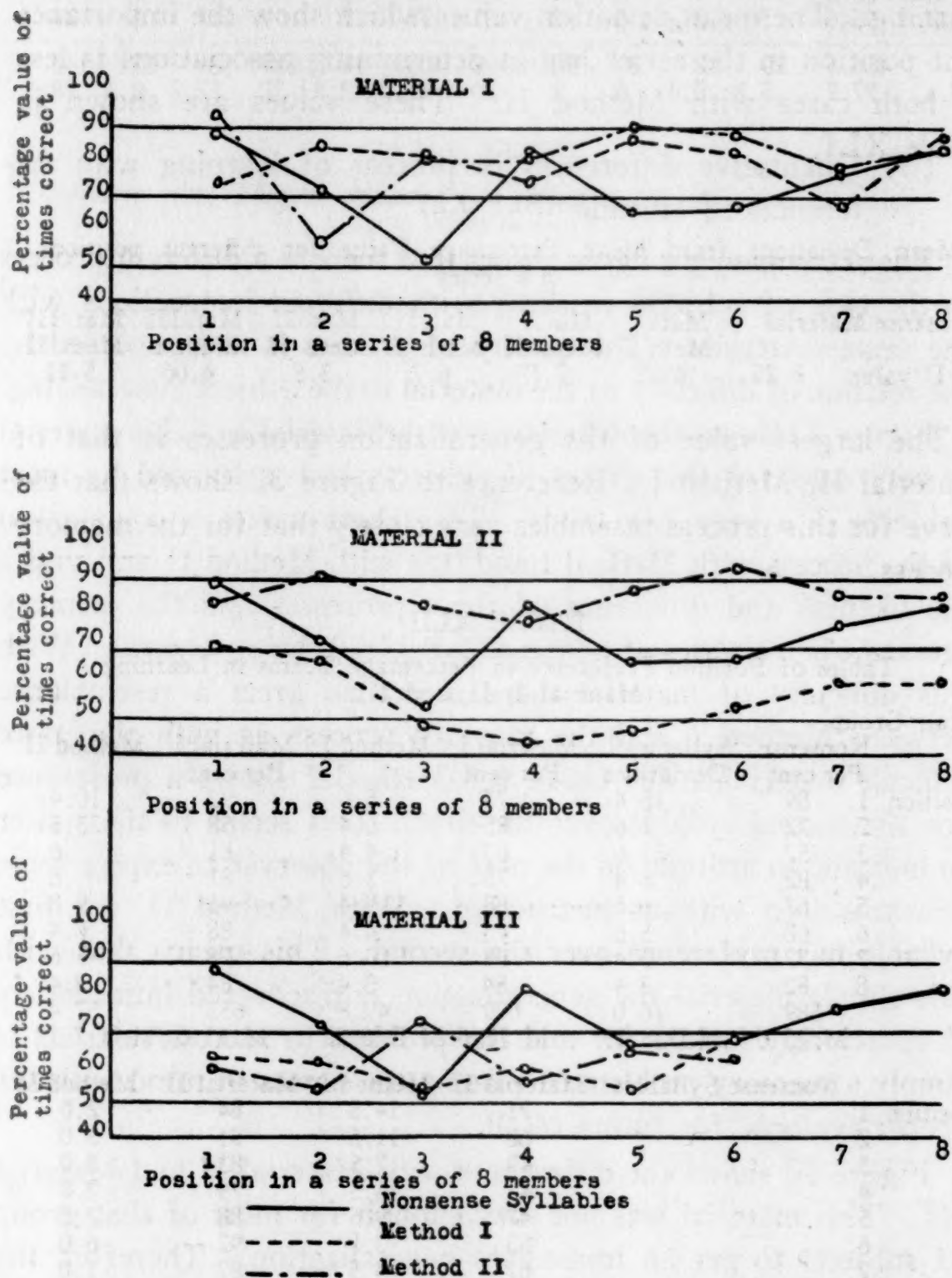


FIG. 32. Adult Group: Comparison of position preference in a series with difference of attitude.



in mathematical terms. It shows the relation of the processes to one another. This shows that with the generalization process there is less difference in the value of different positions in the series. This is particularly clear with Materials II and III, which are difficult enough to stimulate a less abbreviated process of learning. The mean deviation values which show the importance that position in the series has in determining associations is less in both cases with Method II. These values are shown in Table XLI.

TABLE XLI

Mean Deviations from Mean Percentage Value for different positions in a series

| Nonsense Material |      | Mat. I  | Mat. I   | Mat. II | Mat. II  | Mat. III | Mat. III |
|-------------------|------|---------|----------|---------|----------|----------|----------|
|                   |      | Meth. I | Meth. II | Meth. I | Meth. II | Meth. I  | Meth. II |
| M. D. value       | 8.25 | 6.22    | 7.17     | 6.7     | 3.5      | 4.06     | 5.11     |

The largest value of the generalization processes is that of Material II, Method I. Reference to Figure 32 shows that the curve for this process resembles very closely that for the memory process.

TABLE XLII

Tables of Position Preference in Percentage Terms in Learning Material I, II, and III

| Adult Group |    | Nonsense | Syllables I | Material I | Method I  | Material I | Method II |
|-------------|----|----------|-------------|------------|-----------|------------|-----------|
|             |    | Per cent | Deviations  | Per cent   |           | Per cent   |           |
| Position    | 1. | 89       | 15.4        | 73         | 5.6       | 92         | 10.4      |
|             | 2. | 72       | 1.6         | 85         | 6.4       | 58         | 23.6      |
|             | 3. | 52       | 21.6        | 83         | 4.4       | 81         | .6        |
|             | 4. | 82       | 8.4         | 75         | 3.6       | 81         | .6        |
|             | 5. | 67       | 6.6         | 88         | 9.4       | 91         | 9.8       |
|             | 6. | 68       | 5.6         | 83         | 4.4       | 88         | 6.4       |
|             | 7. | 77       | 3.4         | 68         | 10.6      | 78         | 3.6       |
|             | 8. | 82       | 3.4         | 84         | 5.4       | 84         | 2.4       |
|             |    | 589      | 16.0        | 629        | 49.8      | 653        | 57.4      |
|             |    | M. 73.6  | M.D. 8.25   | M. 78.6    | M.D. 6.22 | M. 81.6    | M.D. 7.17 |
|             |    |          |             |            |           |            |           |
| Position    | 1. |          |             | 71         | 14.5      | 84         | 2.0       |
|             | 2. |          |             | 68         | 11.5      | 91         | 5.0       |
|             | 3. |          |             | 49         | 7.5       | 83         | 3.0       |
|             | 4. |          |             | 42         | 14.5      | 79         | 7.0       |
|             | 5. |          |             | 47         | 9.5       | 88         | 2.0       |
|             | 6. |          |             | 53         | 3.5       | 92         | 6.0       |
|             | 7. |          |             | 61         | 4.5       | 87         | 1.0       |
|             | 8. |          |             | 61         | 4.5       | 84         | 2.0       |
|             |    |          |             | 452        | 70        | 688        | 280       |
|             |    | M. 73.6  | M.D. 8.25   | M. 56.5    | M.D. 8.7  | M. 86.0    | M.D. 3.5  |

|             | Nonsense Syllables | Material III | Method I  | Material III | Method II |
|-------------|--------------------|--------------|-----------|--------------|-----------|
| Position 1. |                    | 63           | 2.9       | 60           | 2.5       |
| 2.          |                    | 62           | 1.9       | 55           | 7.8       |
| 3.          |                    | 53           | 7.1       | 74           | 11.2      |
| 4.          |                    | 60           | .1        | 58           | 4.8       |
| 5.          |                    | 55           | 5.1       | 66           | 3.2       |
| 6.          |                    | 68           | 7.9       | 64           | 1.2       |
|             |                    | 361          | 25.0      | 377          | 30.7      |
|             | M. 73.6 M.D. 8.25  | M. 60.1      | M.D. 4.06 | M. 62.8      | M.D. 5.11 |

f. Summary of results of experiments with Adults.

(1) The chances of learning the simpler generalization material is the same with all methods (Methods I, II, III).

(2) The chance of learning the more complex material is less with Method I than with Method II or III.

(3) The efficiency of recall is greatest in every case if instruction referred to as Method I is given at the time of the original learning.

(4) Method III is less efficient for total recall than is Method II.

(5) Qualitative differences are indicated in the process occurring with different instruction.

(a) With the simpler material, Method II resembles the memory process more nearly than does Method I. With the more difficult material Method I resembles the memory process more than does Method II. This indicates an attitude of looking for a generalization as characteristic of adult groups without instruction and this unconscious attitude results in a generalization process if the material is simple enough for the common elements to be easily noted. With the more difficult material the process does not allow for generalization as the main problem, unless it is definitely in mind, and in this case the memory process is more prominent.

(b) Differences in value of different positions in the series are less with the generalization process than with a memory process and also less in the case of Method II than with Method I.

(c) Difference in value of different positions in a series is statable in mathematical terms. This statement is the mean



deviation from the mean percentage value of successive positions in a series.

## 2. Part II. Study of Emotional "Failure" or "Success" Attitude

### A. Introduction to Experiments IV, V, and VI

The general problem in these three experiments was to study the effect, on learning of a memory type, of the attitude resulting from the idea that one is better or poorer in a particular learning performance than other members of one's own group. This was selected as illustrative of the emotional attitude referred to in the beginning of this report (pp. 16, 17). In this case, as in the earlier experiments, a situation had to be arranged where learning would be the main problem and the control of the attitude could be brought about by variations in the instruction accompanying the main problem. The experimenter felt that it was necessary throughout these experiments for the subject to be in ignorance of the purpose of the investigation, thus allowing for a natural response.

The three experiments represent a selection of subjects of different types. Experiment IV deals with adult subjects of university type. Experiment V uses subjects of lower mentality but also of adult type. Experiment VI has as subjects a group of children of a wide range of intelligence. This selection of different types of subjects allows for a study of the differences of effect of the emotional attitudes with different degrees of intelligence and difference of chronological age. With the children, in Experiment VI, a motor memory task rather than an ideational one was the main problem of learning.

### B. Experiment IV

#### a. Statement of problem.

The problem in this experiment was to study the effect, on learning of a memory type, of the emotional attitude resulting from an idea of inferiority of performance, when the subjects used were adult subjects of superior intelligence. The problem

included the arrangement of some learning task and of some control that would bring about the attitude desired. The problem of the subject was the problem set by the experimenter, namely, learning on successive days series of nonsense syllables and re-learning the same series on successive days two weeks after the first learning.

#### b. Materials.

The materials used in this experiment were 10 series of nonsense syllables arranged in booklets of the same type as described for Experiments I, II, and III (pp. 37, 38). Each series contained 10 syllables. These series were arranged in the manner described previously (p. 37) in this report. The actual syllables used are shown in Table XLIII.

TABLE XLIII

Nonsense syllable series used

| No. of Series | Position in Series: |     |     |     |     |     |     |     |     |     |
|---------------|---------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|               | 1                   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  |
| A.....        | ZOF                 | BWG | KYM | LIR | VAP | MEJ | NUZ | GAQ | NEH | HUX |
| B.....        | QOV                 | KUF | DYK | TOS | KWQ | XOM | HYG | CEQ | VWR | GIP |
| I.....        | KON                 | GYS | FWD | ZEG | TOB | KEJ | SIG | MYP | LOD | PWK |
| II.....       | JUK                 | FOH | LWN | ZAM | MIQ | VWN | FOD | CUX | NYJ | DIT |
| III.....      | SOG                 | OEX | FYS | KIG | BOD | NAF | VYZ | HWC | ZYT | FEJ |
| IV.....       | GWR                 | JAF | ZWB | MIP | CUJ | DAP | NYL | TIV | HOS | ZYG |
| V.....        | VEJ                 | XUC | MOK | DEQ | JON | TES | KIB | MUZ | VOL | MEB |
| VI.....       | FYJ                 | QON | MYZ | DWM | ZEQ | VIH | KAG | NUP | PYV | DWB |
| VII.....      | JUF                 | BIR | FUG | BEJ | OYN | SEN | MOV | NWP | JAL | KEX |
| VIII.....     | PAF                 | BYX | VOD | XIK | CAG | VES | RIH | QET | LUN | GEB |

The record sheets used for recording responses were of the same type as used in Experiments I, II, and III (described pp. 41, 42). By the use of a stop watch the experimenter controlled the time of presentation of successive syllables in a series.

#### c. Subjects.

Twelve subjects were used. These were either instructors in the university or graduate students working for advanced degrees.

#### d. Procedure in this experiment.

The first two sets of syllables were used to habituate the subjects to this type of learning. The same method of presenting



and of recording of results was followed as described in Part I with the series learned by the three groups (pp. 41, 42). The only variation in procedure in presenting the syllables, was in the time of exposure of the syllables of the series. The time used in this case was one second for each syllable, with an interval of ten seconds for rest between successive presentations of the same series, and an interval of one day between series.

The subject was given the following general instruction:

#### General Instructions.

"You are familiar enough with the need of control in a psychological experiment to make it unnecessary to go into detail with reference to the necessity of giving the following instructions for you to carry out in the experiment in learning with which you are assisting.

"First. I wish you to start with the intention of completing the series of experiments.

"Secondly. I wish you not to discuss the experiment with anyone during the period of several weeks that the experiment is going on. This refers to all hours in the day, all locations, and all persons. Also I wish you not to discuss the experiment with me, other than as the general plan of the experiment arranges for. Except for some situations unanticipated, the instructions given will be sufficient for all purposes.

"Thirdly, I wish you not to think of the experiment between experimental periods. If it comes to mind, put it out and think of something else.

"Fourthly. Do not do any reading along the lines suggested by the experiment until the completion of the experiment.

"Fifthly. There is need of keeping to the schedule arranged and of continuing until the experiment is completed. That is, the time of starting must be the same on every day. Also, there should be no omissions of days unless absolutely unavoidable."

#### Control of Attitude.

In addition to the above more general instructions, the subject was told that after a few days, when there had been time to score

the results, he would be told his score in relation to the other members of his group, all of whom he knew well. After learning two series of nonsense syllables he was given his score of the previous day at the beginning of the experimental period. These scores were not true scores, but were artifacts arranged for the purpose of controlling the attitude of the subject. Since the subjects did not discuss the experiment outside of the experimental period, they did not discover that the scores were not true scores. At the beginning of the period the subject was told that he had made either the highest or lowest score of any of the group. These reports of scores were given in a certain predetermined order. Table XLIV shows the order used in giving the score that was used to determine the attitude of the subject during the experimental period. (S means Success score of the group. F means Failure score or that the subject was told that he had made the poorest score of any of his group.)

| Subjects<br>Nonsense<br>Syllable<br>Series | Group A |    |    |    |    | Group B |    |    |    |    | Group C |    |
|--|---------|----|----|----|----|---------|----|----|----|----|---------|----|
|  | 1       | 2  | 3  | 4  | 5  | 6       | 7  | 8  | 9  | 10 | 11      | 12 |
| A  | ..      | .. | .. | .. | .. | ..      | .. | .. | .. | .. | ..      | .. |
| B  | ..      | .. | .. | .. | .. | ..      | .. | .. | .. | .. | ..      | .. |
| I  | S       | F  | S  | F  | S  | S       | F  | S  | F  | S  | ..      | .. |
| II   | F       | S  | F  | S  | F  | S       | F  | S  | F  | S  | ..      | .. |
| III  | S       | F  | S  | F  | S  | S       | F  | S  | F  | S  | ..      | .. |
| IV   | F       | S  | F  | S  | F  | S       | F  | S  | F  | S  | ..      | .. |
| V  | S       | F  | S  | F  | S  | S       | F  | S  | F  | S  | ..      | .. |
| VI   | F       | S  | F  | S  | F  | F       | S  | F  | S  | F  | ..      | .. |
| VII  | S       | F  | S  | F  | S  | F       | S  | F  | S  | F  | ..      | .. |
| VIII                                       | F       | S  | F  | S  | F  | F       | S  | F  | S  | F  | ..      | .. |

S—Success. F—Failure. .. no score given to subject.

Group A subjects alternated the Failure and Success score.

Group B carried either the Success or Failure score through 5 days and the opposite score through the 3 days following.

Group C was used as a control group. No scores were given to this group. To be read vertically.

Relearning of the syllables learned on successive days two weeks after learning was carried on in the same manner with all subjects. No scores were given. The point in relearning was to discover whether the attitude present at the time of learning increased or decreased the retention of material learned.



At the end of each experimental period, that is, at the end of the number of trials necessary to learn one set of nonsense syllables, the subject was asked to write an introspective account of the process of learning. He was asked to mention any facts about the nature and behavior of the image in the recall process and to characterize the experimental period as pleasant, unpleasant, etc. This broadside introspective report was asked for in order that the experimenter might get from the subject without direct questioning a statement which would tell whether the control used had produced a conscious effect on the attitude of work. Any form of direct questioning might have led the subject to be suspicious of the purpose of the experiment.

e. Results of Experiment IV.

Table XLV summarizes in tabular form the time taken to learn and to relearn with the different controls. The numbers represent means obtained by finding first for each individual the number of trials taken to learn and to relearn with the S (Success) instruction and with the F (Failure) instruction. Also, for the third group, the means of trials taken to learn and to relearn all series were computed. Next, the means for each group were established by averaging the means for the individuals making up the group. Each number therefore represents a mean score of trials taken in learning or relearning a large number of series. The success scores on learning and relearning would represent means of 41 series learned and relearned. The failure scores would represent the means of 39 series learned and relearned. The score omitted would be a mean score of 20 series learned and relearned.

Table XLV seems to indicate that the time taken to learn is less and also the retention is better where the giving of the success

TABLE XLV

Statistical treatment of results of learning with an idea of Success or Failure

|                                       | Learning<br>Mean of Trials Taken | Relearning<br>Mean of Trials Taken |
|---------------------------------------|----------------------------------|------------------------------------|
| Attitude resulting from failure score | 19.46                            | 10.32                              |
| Attitude resulting from success score | 17.6                             | 9.76                               |
| Control group with score omitted...   | 14.5                             | 7.22                               |

or failure instruction is omitted. The time taken to learn is longer when the failure instruction is given, and the retention is less with the failure instruction.

If the data from the introspective reports are used and those cases who report no change in conscious attitude and evidence no variation in response with different scores are omitted, a different result is obtained in this summary. Table XLV summarizes those cases reporting conscious effects and evidencing these effects in variations of response. This summary omits four cases included in the summary given before.

TABLE XLVI

Statistical treatment of results of learning with an idea of success or failure, omitting those cases reporting no conscious change as a result of the score given

|                                       | Learning<br>Mean of Trials Taken | Relearning<br>Mean of Trials Taken |
|---------------------------------------|----------------------------------|------------------------------------|
| Attitude resulting from failure score | 15.5                             | 8.2                                |
| Attitude resulting from success score | 9.7                              | 5.4                                |
| Control group with score omitted...   | 14.5                             | 7.2                                |

Table XLVI shows that, if the cases reporting no variation in consciousness with change in score given are omitted in the treatment of results, the least time is taken by subjects working with success instruction and the greatest by those working with failure instruction. The recall is more complete in the case of the success score and least complete in the case of the failure score.

The women showed greater variability in response with variation in the score report than did the men. Subjects 2 and 8 gave the greatest variation in response. Subject 8 took 51 trials to learn and 19 trials to relearn a series with the failure instruction, while the success instruction allowed for learning in 12 trials and relearning in 8, with little deviation from this latter value with success report. One man showing most effect from this change of report was one for whom the learning of nonsense material was very difficult and disagreeable. A suggestion of failure, according to his own report, just added itself to his own poor opinion of his ability along this line and seemed to make it impossible for him to learn anything.



One other interesting phase of this experiment was the manner in which this particular group of subjects built up resistances to the failure reports. If this report was continued on successive days, the subject either attempted to explain his failure in terms of some particular happening or else to show that the task was of no importance.

A great variety of terms was used to characterize the experimental task and period. These, in most cases, are not descriptive introspective terms but do give an indication of the subject's attitude for the period in question. They therefore are indications of the conscious accompaniments of the variations in responses noted. A list of some of the phrases and terms used shows the emotive nature of this process:

expected to do poorly, dislike of task, don't care about doing well, critical of self, confusion, all at sea, discouraged, disappointed, unpleasant, despair, annoyance, insecurity, odious, difficult, emotionally disturbed, anxious, dislike, impatient, hopeless, depressed, confused, irritation, limp, hot cheeks, tightness in throat, tendency to squirm, suspicious, angry, disgusted.

relief, interested, curiosity, happy, feeling of well being, contented, desire to do well, confidence, pleasurable, easy, satisfied, calm, excited, liked the exercise, sure of myself, full of zest, cheerful, attempt to get quickly, intention to do well, encouraged, collected, etc.

f. Summary of results.

(1) If all cases are included in the summary, the attitude which results from omitting to give any report of scores on performance gives a better condition for learning than either the attitude resulting from the knowledge of failure or that resulting from knowledge of success.

(2) All cases do not report a conscious change in attitude or evidence a change in response with the failure and success knowledge. The conscious change is reported in 6 of 10 cases.

(3) If only those individuals reporting a conscious change in emotional attitude with change in score report are included, the success score for learning allows for the quickest learning and the most complete recall, while the failure score causes the indi-

vidual to take longer to learn and to recall less completely than either with the success score or with the control group where score was omitted.

(4) Individual variations are noticeable in relation to variability of performance with change in score report. Women are more affected by the score reports and affected in a greater number of cases. The one man most affected by this report was one for whom this task was most difficult. With repetition of failure report, some subjects build up resistance in the form of compensatory idea for the knowledge of continued failure.

(5) With this particular group of subjects the failure report, when effective, seemed to have more power to depress than the success report had to raise the score.

### C. Experiment V

#### a. Problem.

The problem was in general the same as in Experiment IV, to investigate the effect of the attitude of success or of failure in a memory task upon learning of that type. In addition, it was desired to select a different group representative of a lower level of intelligence and to include a larger number of cases. This would allow for more of statistical validity.

#### b. Material.

Two series of nonsense syllables were used in this experiment. Each series contained 8 syllables. The first of these two series was used also in Experiments I, II, and III. The following are reproductions of these two series of syllables:

#### Nonsense Syllables.

Series .. HOX CEK PAF MAR DOF TEK XIX BAJ  
Series II.. BWG KYM LIR VAP MEJ NUZ GAQ NEH

These two series of syllables were arranged in booklet form for presentation (described p. 38). A stop watch was used for timing.



## c. Subjects.

The subjects used were boys at the Whittier State School. Two separate arrangements of this group were used.

Group I: This group contained 48 boys arranged in three groups of equal mentality and chronological age. These were the same subjects and groups as were used in Experiment II.

Group A included 15 subjects with a mean I.Q. of 79.6 and a mean chronological age of 15.8 years. Group B included 18 subjects with a mean I.Q. of 79.3 and mean chronological age of 15.8 years. Group C included 15 subjects with mean I.Q. of 79.0 and a mean chronological age of 15.8 years. These groups proved not significantly different in the factors for which they were equated. More detail of description is given in Experiment II (pp. 83, 84).

Group II: This group was selected to afford two subgroups, a high mentality group and a low mentality group. The high mentality group contained 21 subjects, while the low mentality group included 22 subjects. These main groups were subdivided as shown in Table XLVII.

TABLE XLVII

Group II: Whittier

## High Mentality Group (21 subjects)

Group A—7 subjects—I.Q., mean 100.5, range 92-103; Chronological Age, mean 15.1 years, range 13 years to 16.5 years.

Group B—7 subjects—I.Q., mean 100.4, range 91-107; Chronological Age, mean 15.0 years, range 13.3 years to 16.3 years.

Group C—7 subjects—I.Q., mean 100.4, range 90-111; Chronological Age, mean 15.2 years, range 14.8 years to 16.5 years.

## Low Mentality Group (22 subjects)

Group A—8 subjects—I.Q., mean 70.1, range 56-78; Chronological Age, mean 15.2 years, range 14.9 years to 16.2 years.

Group B—7 subjects—I.Q., mean 69.6, range 68-75; Chronological Age, mean 15.2 years, range 14.5 years to 16.2 years.

Group C—7 subjects—I.Q., mean 70.1, range 62-75; Chronological Age, mean 15.2, range 15.3 years to 16.1 years.

d. Procedure used to control attitude. *Real*

Procedure with Group I: A very simple procedure was used to afford results of a differential type with reference to attitude of subjects working. Nonsense syllable series I had been taught

to Groups A, B, and C for the purposes of Experiment II. To afford data for this experiment, nonsense syllable series II was taught to the same subjects with the following difference of instruction to produce the attitude desired for study. Each member of Group A was told that, in learning the first set, his score was highest in the group. The subjects of Group B were given the second series without instruction and were used as a control group. The subjects in Group C were told that they had made the poorest scores and that their performance could be considered a complete failure. This instruction, given to Groups A and C, did not interfere with Experiment II, since this part of the experiment was given after the completion of Experiment II. In learning nonsense syllable series II, except for the instruction to control the attitude, the procedure was identical with that for nonsense syllable series I described in Experiment II. The method of recording and treating results was also the same.

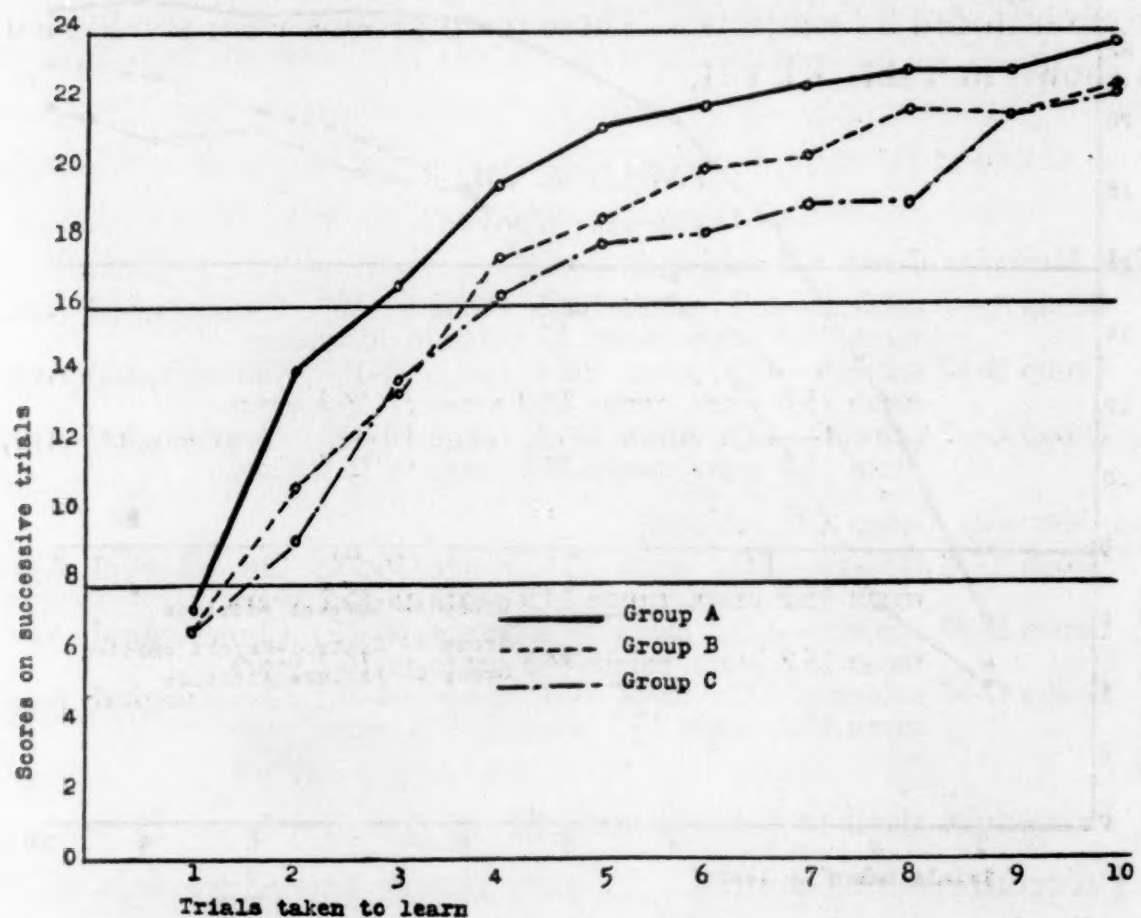


FIG. 33. Whittier Group: Comparison of Groups A, B, and C learning Nonsense Syllable Series I.



Procedure in Group II: The same procedure was used here as with Group I. Both with the low mentality group and the high mentality group nonsense syllable series I was taught without instruction to afford differences of attitude. Nonsense syllable series II was taught with success score report for Group A, no report for Group B, and a failure score report for Group C. The responses were recorded and the results treated in the same manner as in Experiment II (pp. 85, 86). ✓

e. Results of Experiment V.

Results with Group I (equal mentality groups): The measure used here to discover the effect of attitude was the difference in time taken to learn the first series of syllables with no instruction and the second series where the instruction was used. With Group A, which was given the success score previous to learning the second series, the time taken to learn was, on an average, less

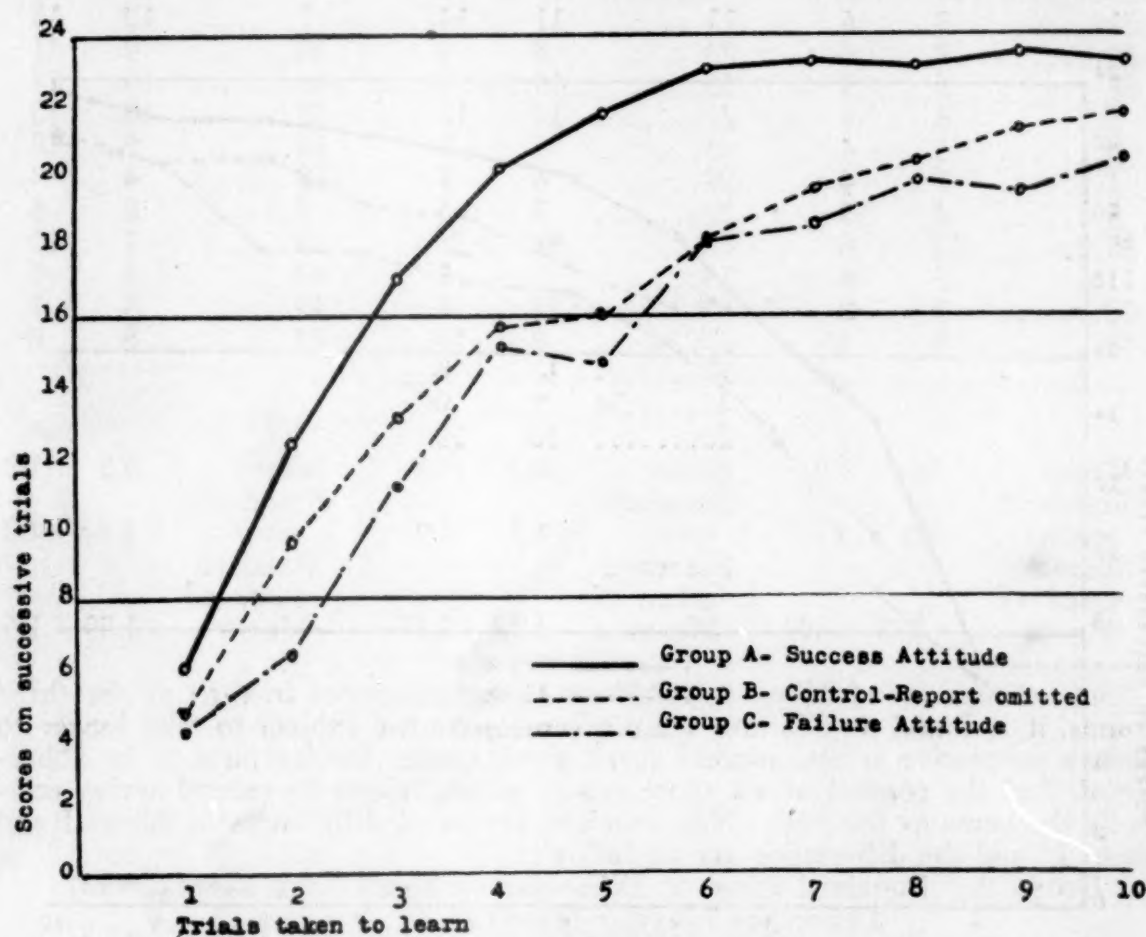


FIG. 34. Whittier Group: Comparison of Groups A, B, and C learning Nonsense Syllable Series II. Group A (encouraged), Group B (control), Group C (discouraged).

for the second series. With Group B, for which the score was omitted, the difference between time taken with the first and second series was not significantly different. With Group C, the time taken to learn the second series was greater on the average than the time taken to learn the first series. With the group (Group I) also the success score seems to have more effect than the failure score. Table XLVIII, Figs. 33-40, show these differences in detail.

TABLE XLVIII

## Whittier Group I

Effect of knowledge of success or failure upon learning a series of nonsense syllables

| Group A (Success Score)   |                  |                   | Group B (Control Group, no score given) |                  |                   | Group C (Failure Score)   |                  |                   |
|---------------------------|------------------|-------------------|---|------------------|-------------------|---------------------------|------------------|-------------------|
| Case No.                  | N.S. I<br>Trials | N.S. II<br>Trials | Case No.                                | N.S. I<br>Trials | N.S. II<br>Trials | Case No.                  | N.S. I<br>Trials | N.S. II<br>Trials |
| 37.....                   | 10               | 8                 | 18.....                                 | 6                | 8                 | 25.....                   | 13               | 14                |
| 26.....                   | 8                | 7                 | 19.....                                 | 15               | 15                | 29.....                   | 16               | 18                |
| 10.....                   | 8                | 6                 | 6.....                                  | 8                | 13                | 45.....                   | 8                | 7                 |
| 27.....                   | 15               | 11                | 2.....                                  | 9                | 6                 | 4.....                    | 13               | 16                |
| 31.....                   | 8                | 6                 | 13.....                                 | 11               | 14                | 7.....                    | 12               | 13                |
| 34.....                   | 7                | 6                 | 23.....                                 | 8                | 9                 | 30.....                   | 9                | 11                |
| 38.....                   | 5                | 5                 | 36.....                                 | 9                | 9                 | 41.....                   | 10               | 14                |
| 3.....                    | 5                | 4                 | 21.....                                 | 14               | 15                | 33.....                   | 10               | 13                |
| 9.....                    | 5                | 4                 | 43.....                                 | 9                | 7                 | 16.....                   | 9                | 18                |
| 1.....                    | 7                | 4                 | 28.....                                 | 6                | 7                 | 12.....                   | 4                | 4                 |
| 5.....                    | 4                | 5                 | 22.....                                 | 7                | 6                 | 8.....                    | 8                | 6                 |
| 35.....                   | 13               | 6                 | 47.....                                 | 27               | 27                | 39.....                   | 7                | 10                |
| 11.....                   | 5                | 4                 | 14.....                                 | 7                | 5                 | 42.....                   | 5                | 9                 |
| 32.....                   | 9                | 8                 | 15.....                                 | 11               | 9                 | 40.....                   | 8                | 7                 |
| 48.....                   | 5                | 4                 | 17.....                                 | 8                | 10                | 46.....                   | 8                | 8                 |
|                           |                  |                   | 24.....                                 | 13               | 8                 |                           |                  |                   |
|                           |                  |                   | 44.....                                 | 7                | 9                 |                           |                  |                   |
|                           |                  |                   | 20.....                                 | 10               | 10                |                           |                  |                   |
| Means...                  | 7.6              | 5.9               | Means...                                | 10.2             | 10.4              | Means...                  | 9.3              | 11.2              |
| Standard error....        | 3.0              | 1.9               | Standard error....                      | 4.7              | 4.9               | Standard error....        | 3.4              | 4.2               |
| Standard error of Means.. | .778             | .496              | Standard error of Means..               | 1.12             | 1.17              | Standard error of Means.. | 1.89             | 1.6               |

If the difference of Mean I and Mean II are compared in each of the three groups, it is found that failure score given causes the subject to take longer to learn a successive series, success score given causes the learning to be abbreviated, and the control or no score report given, leaves to second series relatively the same as the first. The standard errors of differences of Mean I and Mean II and the differences are as follows:

Group A. Standard Error of Difference of Mean I and Mean II .931.  
Difference 1.7 (significant).

Group B. Standard Error of Difference of Mean I and Mean II .61.  
Difference .2 (not significant).

Group C. Standard Error of Difference of Mean I and Mean II 1.83.  
Difference 1.9 (possibly significant).



Results with Group II (high and low mentality groups): The same measure was used to indicate the difference with different attitudes as had been used with Group I, *i.e.*, the difference of time taken to learn a first and a second series of nonsense syllables with the control instruction given just before the learning of the second series. Group A was told that they had made the highest score, Group C that they had failed entirely. Group B was given no score report and was used as a control group.

The results show that there is a difference in the effectiveness of the score report with difference of mentality. The subjects in the low mentality group are not so much depressed by the report of failure as they are helped by the report of success. The subjects in the higher mentality group are more disturbed by the failure report than they are assisted by the success report. The greatest change in time taken to learn with difference of report is in the case of Group C of higher mentality, whose score is greatly

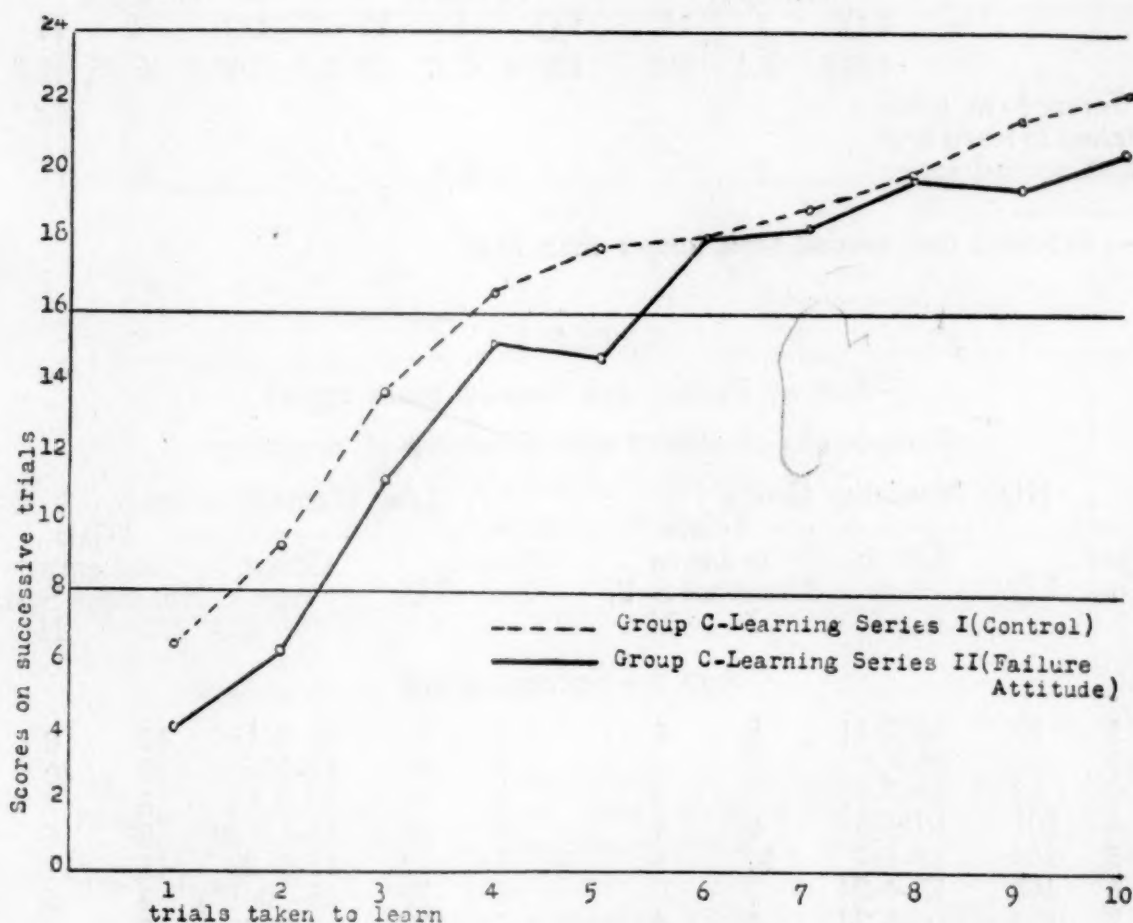


FIG. 35. Whittier Group: Comparison of Group C learning Nonsense Syllables, Series I and II. Series I, Control; Series II, Discouraged.

depressed by knowledge of failure. Table XLIX shows the difference with the different groups with notice of failure or success. Table L gives more in detail differences of performance of groups.

TABLE XLIX

Effect of knowledge of success or failure upon performance in learning a memory series

## Low Group

I.Q. range 56-79

|   | Group B        |                |      | Group C       |                |      | Group A       |                |     |
|---|----------------|----------------|------|---------------|----------------|------|---------------|----------------|-----|
|   | Control Group  |                |      | Failure Score |                |      | Success Score |                |     |
|   | No Score Given |                |      | Given         |                |      | Given         |                |     |
|   | Mean I.Q.      | Mean of Trials |      | Mean I.Q.     | Mean of Trials |      | Mean I.Q.     | Mean of Trials |     |
|   |                | I              | II   |               | I              | II   |               | I              | II  |
|   | 69.5           | 9.8            | 11.2 | 70.1          | 11.0           | 12.4 | 70.1          | 8.9            | 7.4 |
| Difference in trials taken to learn first and second series |                | -1.4           |      |               | -1.4           |      |               | 1.5            |     |

## High Group

I.Q. range 90-112

|   | Group B |     |     | Group C |      |      | Group A |      |     |
|---|---------|-----|-----|---------|------|------|---------|------|-----|
|   | I.Q.    | I   | II  | I.Q.    | I    | II   | I.Q.    | I    | II  |
|   |         |     |     |         |      |      |         |      |     |
|   | 100.4   | 8.1 | 8.0 | 100.4   | 7.0  | 10.3 | 100.5   | 6.85 | 6.0 |
| Difference in trials taken to learn first and second series |         | .1  |     |         | -3.3 |      |         | .85  |     |

— indicates that second took longer than first.

TABLE L

Effect of Failure and Success score report  
Comparison of effects with difference of mentality

| High Mentality Group  |       |            |                                |      | Low Mentality Group |      |            |                                |     |
|-----------------------|-------|------------|--------------------------------|------|---------------------|------|------------|--------------------------------|-----|
| Case No.              | I.Q.  | Chron. Age | Trials to Learn Nonsense Syll. |      | Case No.            | I.Q. | Chron. Age | Trials to Learn Nonsense Syll. |     |
|                       |       |            | I                              | II   |                     |      |            | I                              | II  |
| Group A—Success Group |       |            |                                |      |                     |      |            |                                |     |
| 1                     | 92    | 16-2-11    | 5                              | 4    | 1                   | 56   | 16-3-15    | 10                             | 8   |
| 2                     | 98    | 15-7-0     | 9                              | 8    | 2                   | 65   | 14-11-1    | 10                             | 10  |
| 3                     | 98    | 16-7-13    | 5                              | 4    | 3                   | 68   | 15-8-11    | 8                              | 7   |
| 4                     | 101   | 16-9-6     | 6                              | 4    | 4                   | 69   | 15-11-20   | 8                              | 6   |
| 5                     | 104   | 13-1-1     | 10                             | 9    | 5                   | 73   | 15-9-28    | 15                             | 11  |
| 6                     | 108   | 15-4-24    | 9                              | 9    | 6                   | 75   | 15-10-17   | 8                              | 6   |
| 7                     | 103   | 16-6-28    | 4                              | 4    | 7                   | 77   | 15-6-26    | 7                              | 6   |
|                       |       |            |                                |      | 8                   | 78   | 15-6-15    |                                |     |
| Means                 | 100.5 | 15.1 yrs.  | 6.85                           | 6.00 |                     | 70.1 | 15.2 yrs.  | 8.8                            | 7.4 |



## Group B—Control Group

|       |       |           |     |     |   |      |           |     |      |
|-------|-------|-----------|-----|-----|---|------|-----------|-----|------|
| 1     | 91    | 15-8-3    | 13  | 8   | 1 | 68   | 14-7-21   | 12  | 14   |
| 2     | 93    | 16-4-12   | 7   | 9   | 2 | 63   | 15-4-0    | 6   | 8    |
| 3     | 97    | 15-9-19   | 10  | 10  | 3 | 66   | 15-6-23   | 15  | 15   |
| 4     | 101   | 15-3-9    | 5   | 7   | 4 | 70   | 16-3-8    | 8   | 13   |
| 5     | 106   | 14-8-8    | 7   | 7   | 5 | 72   | 15-10-15  | 9   | 6    |
| 6     | 108   | 14-0-1    | 5   | 5   | 6 | 73   | 16-0-3    | 11  | 14   |
| 7     | 107   | 13-4-3    | 10  | 10  | 7 | 75   | 16-2-19   | 8   | 9    |
| Means | 100.4 | 15.0 yrs. | 8.1 | 8.0 |   | 69.6 | 15.2 yrs. | 9.8 | 11.2 |

## Group C—Failure Group

|       |       |           |   |      |   |      |           |    |      |
|-------|-------|-----------|---|------|---|------|-----------|----|------|
| 1     | 90    | 15-8-14   | 5 | 9    | 1 | 62   | 15-10-21  | 16 | 18   |
| 2     | 94    | 16-1-10   | 8 | 7    | 2 | 68   | 15-4-17   | 9  | 11   |
| 3     | 95    | 16-0-7    | 8 | 8    | 3 | 69   | 15-4-9    | 9  | 8    |
| 4     | 101   | 15-0-4    | 7 | 16   | 4 | 71   | 16-2-23   | 8  | 7    |
| 5     | 104   | 14-11-11  | 7 | 9    | 5 | 73   | 15-6-20   | 13 | 16   |
| 6     | 108   | 16-6-20   | 7 | 15   | 6 | 73   | 16-2-16   | 12 | 13   |
| 7     | 111   | 16-1-16   | 7 | 8    | 7 | 75   | 16-0-19   | 10 | 14   |
| Means | 100.4 | 15.2 yrs. | 7 | 10.3 |   | 70.1 | 15.2 yrs. | 11 | 12.4 |

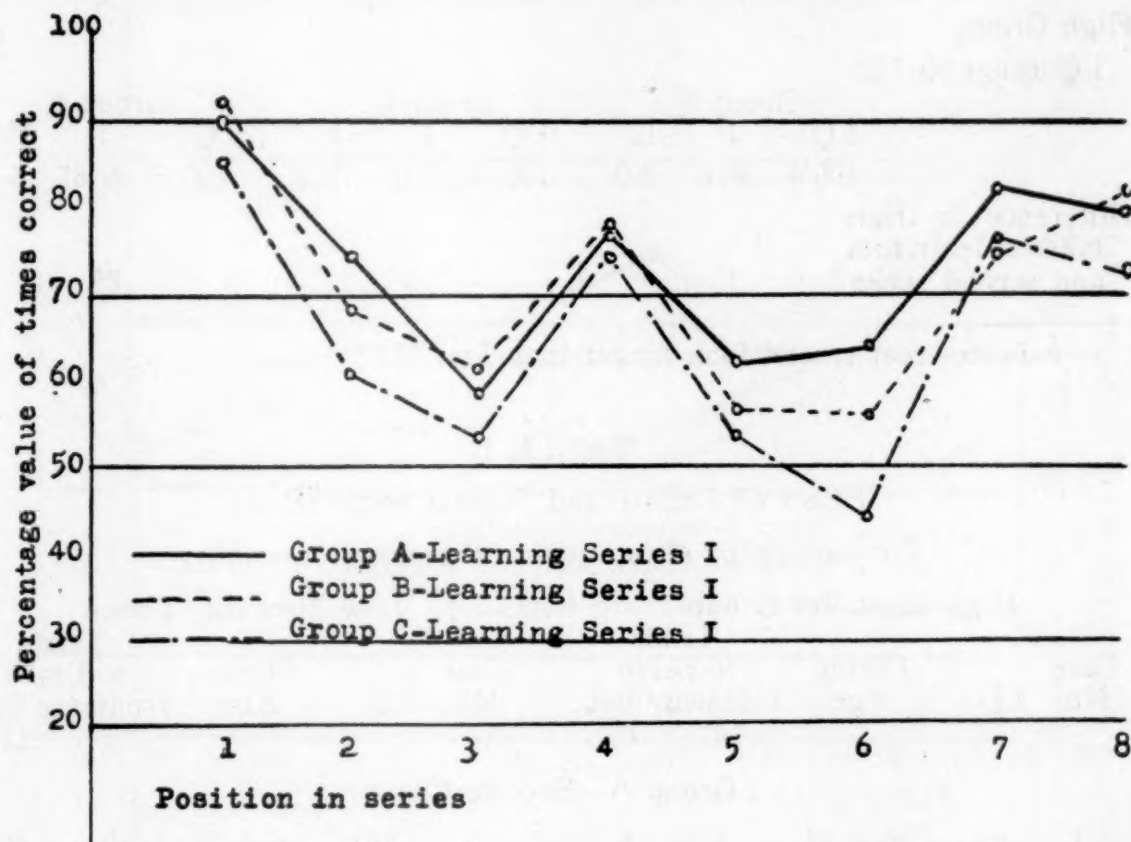


FIG. 36. Whittier Group: Comparison of Groups A, B, and C learning Nonsense Syllable Series I. These were control groups. No instruction was given. Position preference in percentage terms of members in a series. Mean Deviations of percentage values of series:

| Group | Mean Percentage Value | Mean Deviation |
|-------|-----------------------|----------------|
| A     | .735                  | .008           |
| B     | .710                  | .106           |
| C     | .653                  | .107           |

## f. Summary of results of Experiment V.

(1) With groups of equal mentality and chronological age, the time taken to learn a memory series is varied with knowledge of failure or success in a previous performance. The knowledge of failure increases and the knowledge of success decreases the time taken to learn. The difference, if the success report is given, is more significant than if the failure report is given. This is the case with equal groups of low mentality (M.I.Q. —79).

(2) With groups of different mentality there is a difference in the effectiveness of the failure and success reports with difference of intelligence of subjects learning. The greatest difference of time taken is in the case of high mentality group working with knowledge of a previous failure. The general effect on the process of learning is to increase greatly the time taken to learn. With the same high mentality group the knowledge of a previous

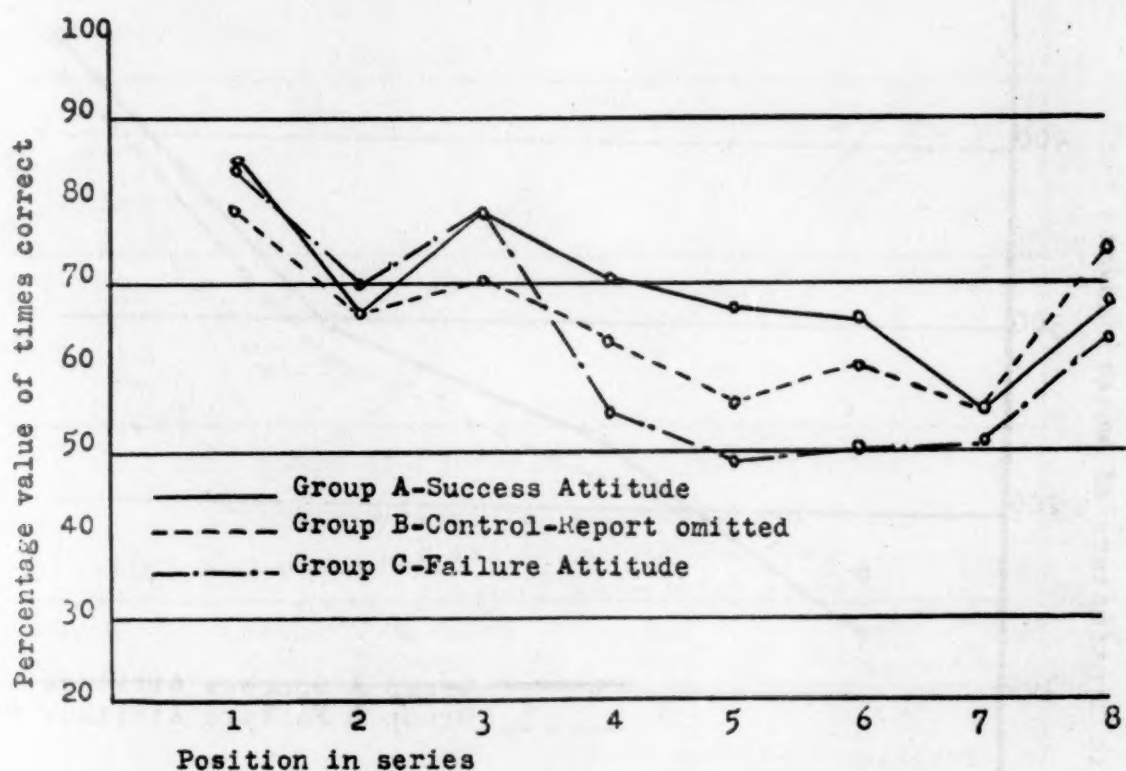


FIG. 37. Whittier Group: Comparison of Groups A, B, and C learning Nonsense Syllable Series II. Group A was encouraged, Group B was used as a control group, Group C was discouraged. Position preference in percentage terms of positions in a series.

Mean Deviations from Mean Percentage Value of series:

| Group | Mean Percentage Value | Mean Deviation |
|-------|-----------------------|----------------|
| A     | .698                  | .0708          |
| B     | .648                  | .0643          |
| C     | .617                  | .1140          |



success has little effect in decreasing the time taken to learn. With the low mentality group, knowledge of failure does not increase the time taken to learn, but knowledge of success does decrease the time taken. In general, the failure report is more effective in the case of the high mentality group and the success report more effective in the case of the low mentality group.

#### D. Experiment VI.

##### a. Problem.

This experiment is introduced here because it gives some information with reference to the effectiveness of the failure and success report when the subjects are children of 8 and 9 years and the problem is a task of motor coördination.

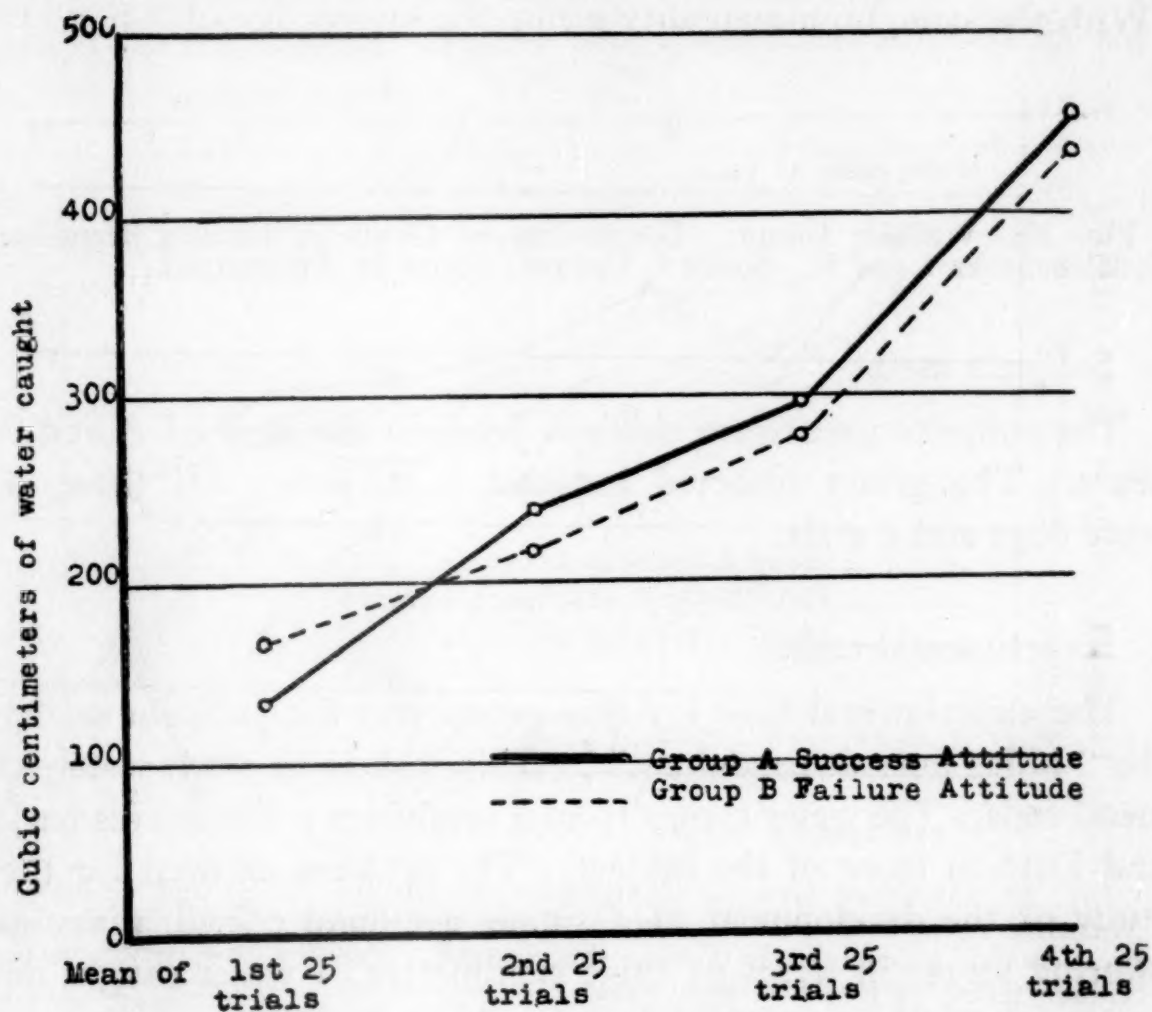


FIG. 38. Children: Changes in relative position of scores of subjects learning a motor task with knowledge of Success or Failure in performance. (Failure and Success reports not given in first 25 trials.)

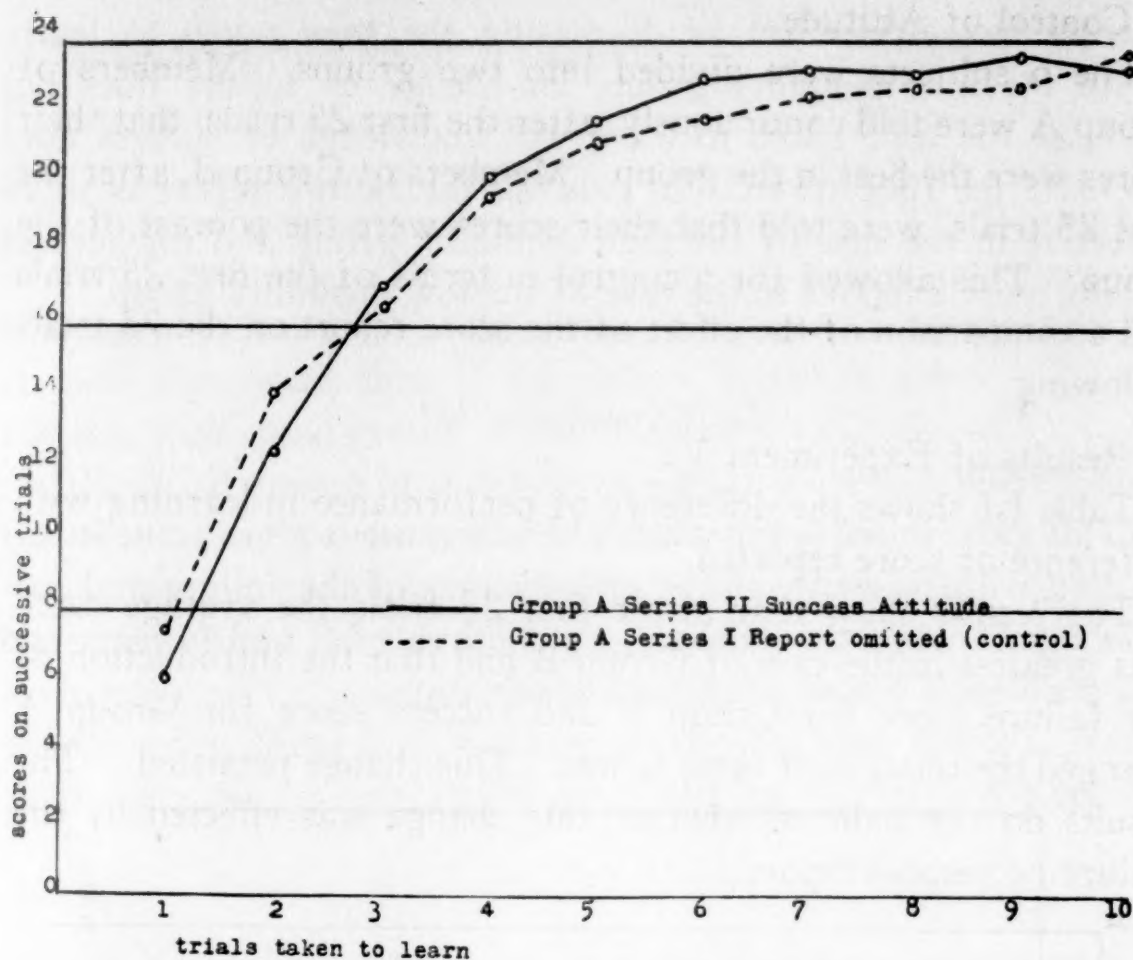


FIG. 39. Whittier Group: Comparison of Group A learning Nonsense Syllable Series I and II. Series I, Control; Series II, Encouraged.

b. Subjects used.

The subjects used were children between the ages of 8 and 9 years. The group reported included 6 subjects. Of these, 4 were boys and 2 girls.

c. Experimental task.

The experimental task for this group was the problem set by the "Miles pursuit pendulum."<sup>1</sup> This task is to catch water in metal cups. The water comes from a pendulum which moves back and forth in front of the subject. The problem allowed for the study of the development of a simple eye-hand coördination by offering scores in terms of cubic centimeters of water caught on successive trials (complete description given by Miles).

<sup>1</sup> MILES, WALTER R. A Pursuit Pendulum. *Psychol. Rev.*, 1920, 27, 361.



## d. Control of Attitude.

The 6 subjects were divided into two groups. Members of Group A were told continuously, after the first 25 trials, that their scores were the best in the group. Members of Group B, after the first 25 trials, were told that their scores were the poorest of the group. This allowed for a control in terms of the first 25 trials and a comparison of the effect of the score report on the 75 trials following.

## e. Results of Experiment VI.

7 (Table LI shows the difference of performance in learning with difference of score reported.)

The results show that in the first 25 trials the average catch was greatest in the case of Group B and that the introduction of the failure score for Group B and success score for Group A changed the relation of these scores. This change persisted. The results do not indicate whether this change was effected by the failure or success report.

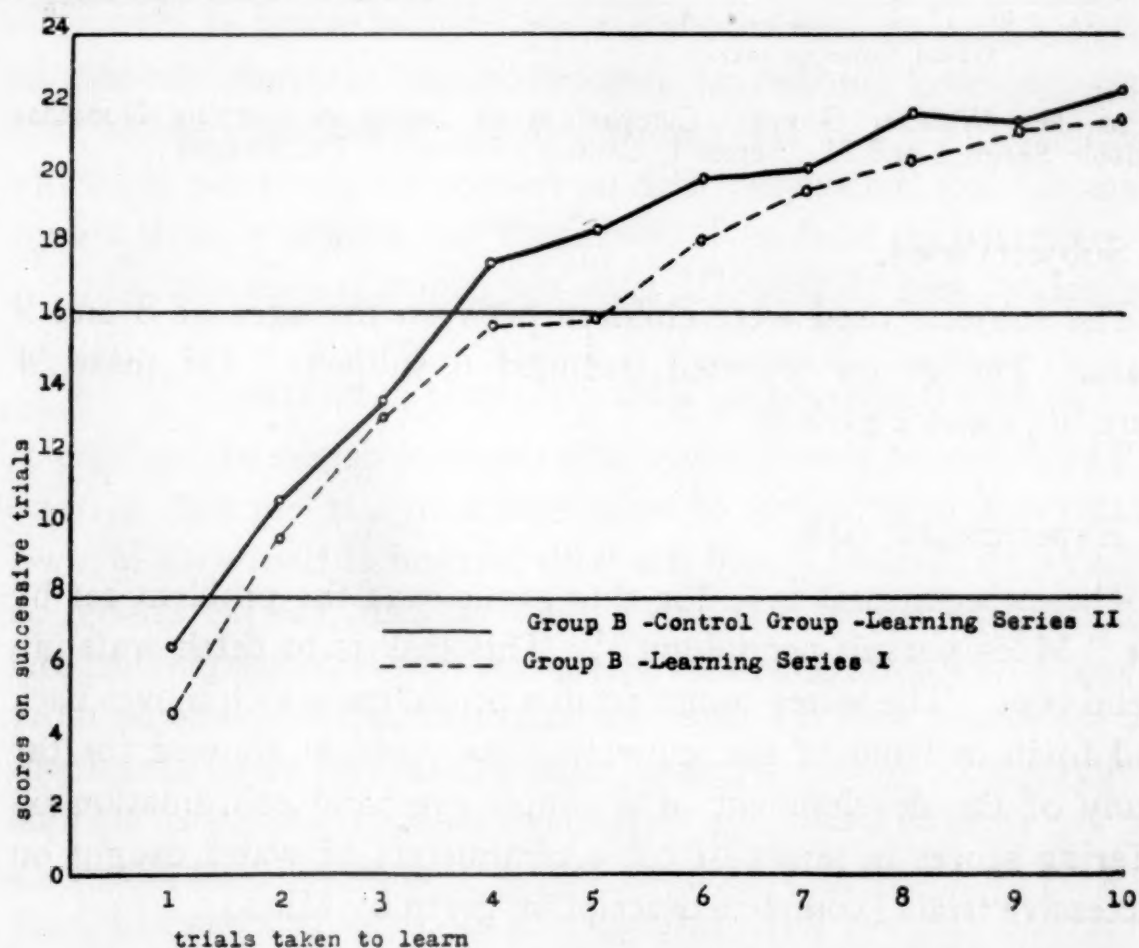


FIG. 40. Whittier Group: Comparison of Group B learning Nonsense Syllable Series I and II. Series I, Control; Series II, Control.

TABLE LI

Results of Failure and Success report with six eight-year-old children learning a motor problem

## Group A—Success Score

(c.c.—Cubic centimeters of water caught.)

| Case No.  | 1st 25 trials | 2nd 25 trials | Scores Sum of<br>3rd 25 trials | 4th 25 trials |
|-----------|---------------|---------------|--------------------------------|---------------|
| 1.....    | 140 c.c.      | 190 c.c.      | 322 c.c.                       | 475 c.c.      |
| 2.....    | 145 c.c.      | 267 c.c.      | 320 c.c.                       | 447 c.c.      |
| 3.....    | 108 c.c.      | 255 c.c.      | 247 c.c.                       | ...           |
| Mean..... | 131 c.c.      | 237 c.c.      | 296 c.c.                       | 456 c.c.      |

## Group B—Failure Score

|           |          |          |          |          |
|-----------|----------|----------|----------|----------|
| 4.....    | 259 c.c. | 275 c.c. | 345 c.c. | 498 c.c. |
| 5.....    | 140 c.c. | 177 c.c. | 350 c.c. | 380 c.c. |
| 6.....    | 100 c.c. | 197 c.c. | 132 c.c. | ...      |
| Mean..... | 166 c.c. | 216 c.c. | 279 c.c. | 439 c.c. |

## IV. CONCLUSIONS AND INTERPRETATIONS

## 1. Summary and Conclusions with Reference to "Intellectual Generalization" Attitude.

The following conclusions are reported in terms of the variations of the "intellectual generalization" attitude defined as Methods I, II, and III (pp. 00, 00). It will be recalled that Method I left the subject with no instruction about the possibility of generalizing, Method II instructed the subject to seek a generalization, and Method III gave the generalization outright.

## A. Chance of generalizing with variations in attitude.

The chance of generalizing, with the same degree of intelligence of subjects, in situations of equal complexity, is less with Method I than with Method II and less with Method II than with Method III. As the material becomes more difficult, the percentage of subjects failing to generalize in a given time becomes greater, and the difference with the three variations of attitude become more exaggerated. With a decrease in the difficulty of materials affording the generalization, the differences with variations of attitude tend to be eliminated and, as far as chance of generalizing is concerned, there is little difference in the three processes. Table LII summarizes some of the facts leading to the above statement.



TABLE LII

Percentage of subjects not generalizing in the time allowed with different attitudes and difficulties of material

| Group            | Material | Method I | Method II | Method III |
|------------------|----------|----------|-----------|------------|
| Children .....   | I        | 31       | 0         | 0          |
| Adolescent ..... | I        | 40       | 23        | 0          |
| (Whittier)       | II       | 67       | 47        | 0          |
| Adult .....      | I        | 0        | 0         | 0          |
|                  | II       | 34       | 0         | 0          |
|                  | III      | 60       | 0         | 0          |

#### B. Time taken to generalize with difference in attitude.

The time taken to generalize with equal groups of children, adolescent subjects of low mentality, or adults, when generalization occurs, is greater with Method I than with Method II. (The present study does not afford a comparison of the time taken with Method III, since this time was arbitrarily determined previous to presenting the material. It was attempted to make the time with Method III a time value between that taken with Methods I and II in order that the recall values with these three attitudes could be compared.) Table LIII summarizes some of the facts with reference to time taken by various groups with different attitudes and graded difficulties of materials.

TABLE LIII

Time taken to learn with different attitudes and difficulties of material  
(Numbers represent trials taken to learn)

| Group            | Material | Method I | Method II | Method III<br>(arbitrary) |
|------------------|----------|----------|-----------|---------------------------|
| Children .....   | I        | 28       | 18        | 30                        |
| Adolescent ..... | I        | 12       | 7.4       | 10                        |
| (Whittier)       | II       | 11.8     | 11.8      | 10                        |
| Adult .....      | I        | 7.0      | 6.8       | 6                         |
|                  | II       | 26.2     | 7.5       | 6                         |
|                  | III      | 37.0     | 17.2      | 6                         |

#### C. Value for recall of generalizations having different attitudes at the time of learning.

The value for recall, where learning has occurred, is greatest in the case of the generalization arrived at with Method I variation of the attitude and least with Method III. This difference tends to be eliminated with the very difficult material (difficulty relative to ability of subjects learning), but to remain true of the very

easiest material. The summary in Table LIV indicates these differences.

TABLE LIV

Recall value of generalizations arrived at with different intellectual attitudes

(Scores are percentage scores of recall on basis of complete and perfect recall as 100 per cent.)

| Group            | Material | Method I | Method II | Method III |
|------------------|----------|----------|-----------|------------|
| Children .....   | I        | 91       | 73        | 66         |
| Adolescent ..... | I        | 91.8     | 60.9      | 47.8       |
| (Whittier)       | II       | 72.0     | 43.7      | 62.1       |
| Adult .....      | I        | 95       | 88        | 63         |
|                  | II       | 96       | 92        | 78         |
|                  | III      | 100      | 87        | 81         |

One other interesting fact with the adult group is that the recall value for the difficult material seems to be greater than for the simpler material. Also with Material II, for Whittier group, the difficulty seemed to be such as to change the relative values of Methods II and III.

#### D. Relation of intelligence to chance of generalizing and time taken with difference of attitude.

Intelligence seems to have a decided correlation with chance of generalizing and time taken to generalize with Method I and with time taken with Method II. No correlation could be found with Method III, but this was because the technique of this experiment did not present differential results with reference to time with Method III.

The relation between intelligence and chance and time for generalizing seems to become less if the material is either very easy or exceedingly difficult for the subjects. In either of these cases some other factors probably determine when generalization will occur. This relationship found between intelligence and generalizing does not mean that differences of time taken with different groups working with different attitudes can be explained in terms of differences of intelligence, for in every case groups so compared had been equated in intelligence. It means only that, within the limits of the given attitude, intelligence plays a part in determining the chance that the given individual will hit upon the common



element and in this manner intelligence determines the time taken by the individual in relation to other members of his attitudinal group. The highest relationship existed with a certain difficulty of material and Method II. This was possibly because this attitude more nearly resembles the mental test problems that determine the intelligence score. Therefore intelligence is *only one of the factors* which functions within the limits of the defined attitude.

E. Qualitative differences in response with difference of attitude.

Qualitative differences are objectively demonstrable in the learning responses of subjects working with different attitudes and, in the case of Method I, with subjects assuming different attitudes with the same instruction. The technique did not allow for an objective record of variations in type of response with Method III, therefore these observations have to do only with Methods I and II and with the Memory response. The following differences were noted in quality of processes:

a. The curve of learning (scores on successive trials) is more regular in its rise in the case of Method I than Method II. In this way the curve for Method I resembles the curve of memory in learning a series of nonsense syllables. The curve for that part of the group working with Method I attitude who are not going to generalize is less abrupt in its rise from the second trial than is the curve for the part of the same group who are going to generalize.

b. The curves which show the percentage of times in the total of trials taken to learn are very different in the case of Methods I and II and also in the cases of those subjects learning with Method I and those not learning with Method I. These differences are as follows:

(1) The generalization process, in all of its variations of attitude, shows less difference in values of different positions in the series than the memory process.

(2) The relative value of position 2 in the series becomes greater in the case of Method I than with the memory process and greatest in the case of Method II.

(3) The percentage value curves for those working with Method I attitude, who are not going to generalize, show that this group of subjects is not taking advantage of associations offered with individual members of the series, and that they are not noticing likenesses between two or more members. The curve for Method I shows that the subjects are taking advantage of every association offered. They also arrive at elements common to the group by noticing likenesses occurring between members and using these to facilitate recall.

(4) The mean deviation from the mean percentage value of series is less in the case of the generalization process than in the case of the memory process. Also it is less in the case of Method II than Method I. This value is thus a measure of the amount of generalization taking place or of the tendency of the percentage curve to approach a straight line. This relationship of size of this mean deviation value to the type of process is true only of material having a certain difficulty relationship to the subjects learning and becomes less noticeable with excessively difficult material where generalization seems almost impossible or with extremely easy material where generalization is immediate and the problem of further learning is to place the individual elements in memory for future recall.

(5) The mean percentage value of positions in a series affords a single measure of learning. This approaches 100 per cent in cases where learning occurs immediately and tends toward zero where learning is delayed. The value, in these cases, is least in the case of Method I and greatest in the case of the memory process. This means that learning is more immediate or quicker in the case of purely nonsense material than in the case of material affording a generalization. The value is less in the case of Method I and Method II. This agrees with other measures of time to learn with the two attitudes.

If the mean percentage value is used along with the mean deviation from this mean percentage value, the two measures give a record of difficulty of material and of amount of generalization taking place. This last (amount of generalization taking place)



is measured truly and comparisons are valid only if equal groups working with the same complexity of material are compared.

F. Differences of attitude with the same instruction.

Method I group offered objective records of differences of attitude resulting from the same instructional situation. The following differences of attitude were evidenced in the response: (1) Some subjects showed a tendency to seek a generalization but chanced upon some incorrect or only partially satisfactory likeness and were unable to discard this in favor of a more satisfactory response. In these cases it did not seem that adding further trials tended to bring the generalization nearer, but rather the incorrect idea became fixed as a response and stood in the way of the more satisfactory response. (2) A certain group showed the same tendency to generalize, in the absence of instructions, but seemed able to discard an unsatisfactory response in favor of one more generally satisfactory. (3) A third group showed no tendency to seek a generalization but accepted the task as a memory series and learned the successive similar series with no variation in this response.

This group again divided itself into two parts. The first tended to have the memory response become the fixed reaction to this material, while the second finally seemed to become aware that the material offered possibility for a different type of response. This occurred in two cases with the material that was used to measure the recall value of the generalization learned.

G. Relation of differences with different attitudes of groups used to memory ability of groups measured by learning records of purely nonsense memory series.

The differences so far noted as characteristic of different attitudes are not explainable in terms of difference of intelligence, chronological age, or memory measured by learning purely nonsense series. These differences were noted in groups with these factors kept constant. The most favorable attitude for learning and recall, in individual cases, sometimes was demonstrated in

subjects or groups whose scores on a purely memory series were lowest.

H. Relation of ability to use and ability to reproduce detail of elements used.

Success in generalization and complete functioning of the generalization for recall is not always accompanied by ability to reproduce in detail or draw the elements used in generalizing. The knowledge of detail varies: (1) Elements can be used without ability to reproduce the elements used in detail; (2) elements can be used with ability to reproduce such elements partially only; (3) elements can be reproduced without ability to use these same elements; (4) elements can be learned by exclusion, as "the part left," "the other part," "the third one"; (5) elements can be used correctly and reproduced incorrectly. This seems to mean that the subject substitutes some association found useful for recall for the original element. The generalization attitude thus extends to modify the contents of the original material to suit the use to which this content is to be put by the individual.

I. Statistical devices found useful in treating the results of learning:

- a. Scores on successive trials and means of scores for groups of subjects compared.
- b. Percentage values of positions in a series used to demonstrate qualitative differences in response.
- c. Mean percentage value of series used as a single measure of learning of a series.
- d. Mean deviation from the mean percentage value used as a measure of generalization.
- e. Trials taken to learn and mean of trials for groups working with different instructions.
- f. Correlation methods to discover relationships between intelligence and other facts.
- g. Standard errors of differences of means to determine the significance of differences observed in the behavior of groups compared.



### J. Summary.

a. Chance of generalization is less and time taken longer in the case of Method I than Methods II or III, and in the case of Method II than of Method III.

b. The value of the generalization for future recall is greater in the case of Method I than Method II, and in the case of Method II than Method III.

c. Intelligence is one factor determining the chance of generalizing and time taken to generalize within any given attitudinal group.

d. Qualitative differences are objectively recorded in the learning of subjects working with different attitudes. Such differences are observable between subjects working with Method I who assume different attitudes of work, between purely memory records and generalization records, and between the process with Method I and that with Method II. These differences are best brought out by position preference curves in percentage terms and mean deviation values from the mean percentage value of a series.

e. Differences of attitude of work are objectively recorded in the learning of subjects working with Method I. The result with Method II shows that this group is more homogeneous in its attitude of work.

f. Differences observable with different attitudes are not referable to differences of intelligence, chronological age, or to memory differences.

g. Ability to reproduce details of a situation which allows for generalization is not necessarily a measure of the satisfaction of the generalization for responding to like situation. The generalization can be used in the absence of ability to reproduce all or, in some cases, even part of the detail of the original material. In some cases an incorrect reproduction is given of elements which are used with ease. This incorrect reproduction seems to be a function of the generalizing attitude.

## 2. Summary and conclusions with reference to "Emotional Failure and Success" Attitudes.

### A. Time taken to learn.

a. With adult subjects, if the whole group is included, the time taken to learn a memory series is greatest with knowledge of previous failure, and least with the control group where no score is given, *i.e.*, absence of knowledge of success or failure. The time taken to learn with knowledge of previous success lies between that with the failure knowledge and with absence of knowledge.

With the same subjects, if only those are considered who report subjective changes with variation in score given, the relative time to learn is changed. In this latter case the time is still greatest with the failure score, but the success score takes least time to learn.

b. With adolescent subjects (Whittier Group I), the time taken to learn is varied with the failure and success report. Knowledge of failure increases and knowledge of success decreases the time taken to learn. The success report makes more significant changes with this group than the failure report. With the adult group the failure report made more significant changes in time than did the success report.

### B. Value for recall.

The only direct data from these experiments with reference to this point is from the adult group. This is measured by the time taken to relearn, after a two-weeks interval, the material learned with different attitudes. These data show that the time taken to relearn is greatest in the case of the failure score. If all cases are included, the time taken to relearn is greater in the case of the success score than if no score is given to the subject. If those cases who report no subjective change with change in score reported are omitted, the success report takes less time to relearn than the control cases where no report was given.



C. Individual differences in effect of emotional failure and success attitudes.

a. With the adult subjects all cases did not report changes in consciousness with failure or success score. No change is reported in 40 per cent. of cases. The women as a rule showed more variation in performance with change in score report than the men. In the case of one subject for whom the particular task was very difficult and disagreeable, the change in score made more difference than the average. This was the case of a man. In some individuals the differences are very much exaggerated, in other cases very slight. There are individual subjects in whom the direction of change is opposed to that of the group; that is, the failure score causes the subject to take less time to learn, or the success score more time to learn.

b. With the adolescent group the changes are not evidenced in every subject. The per cent of cases showing change is greater than with the adult group. There are, with this group as with the adult group, subjects whose time is decreased with the report of a previous failure. There are few, if any, cases in this group who are not affected in the same direction as the group by the success report. This report generally decreases the time taken to learn. In a few cases differences observable in the groups are greatly exaggerated in the individual case, *i.e.*, subjects are greatly affected by the attitude. On the whole, individual variations were less noticeable with this group than with the adult group.

D. Group of cases which the control of this experiment does not take into account.

The conditions of this experiment eliminated the problem of subjects discontinuing a task which was disagreeable. With the adult subjects a promise had been obtained before starting the experiment that the subject would continue to the end. This promise was the only thing standing in the way of the discontinuation of the task by several subjects greatly affected emotionally by the failure report. For the Whittier group the continuance of

the task was assured by the routine of the institution and because of a friendly attitude of the boys toward the experimenter.

In interpreting the results of this experiment, it must be kept in mind, therefore, that in an experimental situation of this type the group who might discontinue a task in which they failed is not treated. It would be of great importance in a practical situation.

E. Relation of differences in response to failure and success report to differences in intelligence.

a. Comparison of adult and adolescent group: The adult group, in this case, represents a very high intelligence group and this adolescent group a very low intelligence group. The adults were more affected by the failure report. The time under this condition was much increased. The adolescent group was more affected by the success report and less affected by the failure report. This difference seems to be due to two circumstances: First, the high mentality subjects are more accustomed to and therefore less affected by success reports while they are less accustomed to and therefore appreciate the meaning of a failure report; secondly, the low mentality subjects are more accustomed to and appreciate less the meaning of failure reports. That the success report has an effect with this group is possibly because of the personal reaction, the low mentality subjects feeling that the experimenter is pleased with their performance. For them this is an unusual and pleasant experience.

b. Comparison of low mentality and high mentality: Special Whittier groups: The subjects were of the same chronological ages and of the same social groups but differed widely in intelligence. This low mentality group was much more retarded than the adolescent group mentioned above. The results show that the greatest difference in learning is with the high mentality group working with a failure report. Knowledge of success had little possibility of improving the score with the high mentality group. With the low mentality group the results are just the opposite. The knowledge of success tends to decrease time, and knowledge of failure is ineffective. The change with the failure report with



high mentality individuals is greater than the change noted with success report with low mentality subjects. Therefore, the difference with difference of intelligence seems to be that the high mentality is more active in its reaction to knowledge of failure and the low mentality to knowledge of success.

F. Differences in response with repetition of failure or success reports.

With the adult subjects, the failure or success reports were continued in some cases for several days in succession. In some instances the subject built up resistances to overcome the knowledge of failure. These compensatory ideas were reported and the objective records show a decrease in effectiveness of the depressing idea. With the group of children, as far as this experiment went, the effect of knowledge of success or failure seemed to continue with its original force. In the case of the children, however, the data do not show which of the two ideas, *i.e.*, success or failure, is active, since the control group was omitted here.

G. Differences in results with "emotional failure or success" attitudes with different chronological age.

The differences were noticeable with all chronological ages. The only noticeable difference due to age was that with adults the effects of attitudinal changes were less persistent than with children. This is possibly due to the experience of adult subjects in building up resistances to ideas which they find hinder their performance. With children there seemed little tendency to build up corresponding resistances.

H. Summary.

a. In general, the time taken to learn a memory series is increased by the knowledge of failure in a previous performance and decreased by the knowledge of success in a previous performance.

b. Individual variations are noticeable in the effectiveness

of the failure and success knowledge. Women are more affected by the reports than men. Those for whom the task is most difficult are more affected than those for whom the task is easier. Some subjects show no variation in time taken to learn although there is a variation in score report. A few subjects vary in a direction opposite from the group, *i.e.*, the time taken to learn increases with knowledge of success and decreases with knowledge of failure.

c. The value for recall, measured by abbreviation of time taken to learn, is less in the case of the failure report and greater in the case of the success report.

d. Subjects of high intellectual capacity are more affected by knowledge of failure, and subjects of low intellectual status by knowledge of success. Conversely, subjects of high mentality are little affected by reports of success and those of low mentality little affected by knowledge of failure. These comparisons are made with reference to a group whose score reports are omitted but who provided a control condition.

e. Some adaptation is shown in the case of adult subjects to a continued failure report. The introspective account suggests that the subject builds up compensatory ideas to overcome the knowledge of failure. With children, as far as this experiment shows, the imposed attitude continues affective so long as they are given the report of failure.

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